The Sponges of the West-Central Pacific

By

M. W. de Laubenfels

OREGON STATE COLLEGE
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By

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Professor of Zoology
Oregon State College

The materials here treated consist principally of my collections made during the months of June, July, August and September, 1949. At least one specimen of each of these species has been deposited in the United States National Museum, including the types of all new species. Another series of dried specimens (not here referred to by numbers) was deposited in the Bernice P. Bishop Museum in Honolulu. Discussion is included of specimens collected at Bikini and Eniwetok by various biologists who studied there in 1946, 1947, and 1948. Some of these had been sent to the U. S. National Museum and thence forwarded to me. Others were sent first to the University of Washington and transmitted from there to me.

The two previous brief mentions of sponges from the area under consideration are also re-embodied in the present discussion. These two are: (1) reference to three species from the Palaus by Tanita in 1943, and (2) to three species from Yap by de Laubenfels in 1949.

Extensive assistance was furnished to me, for which gratitude is here expressed. The funds which made the investigation possible were provided by the United States Office of Naval Research, and the whole project was sponsored by the Pacific Science Board of the National Research Council. The United States Navy provided transportation and lodgings, and so (on a smaller, but most interesting scale) did many natives of the regions studied. In the field, in the Palaus, Mr. and Mrs. Peter J. R. Hill gave valuable assistance, and in Guam, similar help was rendered by Mr. A. B. Bronson. Collections were made at Bikini and Eniwetok by T. E. Bullock, J. P. E. Morrison, W. R. Taylor, F. M. Bayer, and F. C. Zimmerman. Portions of the drawings for the text figures were made by Mr. Evan Gillespie, who is the artist for the biological departments of the University of Hawaii. Secretarial help came from Mrs. Louise Morgan of Oregon State College, and from my wife, Mrs. Beth J. de Laubenfels.

The area here studied extends from 130° to 180° east longitude and from the equator to 20° north latitude. These several millions of square miles are chiefly open ocean but include four large groups of islands. In

each of these four, intensive study was made at widely scattered points. The four groups are the Marianas, the Palaus, the (eastern) Carolines, and the Marshalls. They are sometimes collectively termed Micronesia.

Only shallow water sponges are treated here. A few of the specimens from Bikini and Eniwetok were dredged, but not from very deep water, about 50 meters at the deepest. Others were collected by hand, while wading.

My usual method of collection was as follows: First, the services of one or more native so-called divers would be obtained to gather specimens. These men are able to swim (rather than dive) down to depths of many meters and to continue collecting at such depths for more than a minute. Then we would set out in some small craft, by necessity one with a low freeboard. During the summer, at one time or another, we employed dugout canoes, outrigger sailing canoes, rowboats, inflated life rafts, occidental-type sail boats, outboard-powered boats, and inboard motor boats. When the divers were in the water, I was able to point out desired specimens, using a viewing box or water-glass. I made extremely frequent use of this device, which was capably built for me by the carpenters of the University of Hawaii, and viewed many square miles of sea-bottom. It was easy to see clearly to depths of 5 meters, often reasonably clearly to depths of 10 or more meters. In water less than 2 meters deep, I was able to do some of the collecting personally. Such was the richness of the fauna, and the industry of the divers in some places, that it was a hectic task to keep up with the needed bottling of specimens and the taking of notes.

The present discussion is divided into two parts. The first is a description of the Porifera which were studied. The second describes the regions, and the ecological relationships of the sponges thereof.

The collections which are discussed here aggregate some 183 species. It should be noted that, as in all animal groups (but especially in the Porifera), species may be difficult to delimit. That is to say, how much difference may be tolerated as variation within a single species? For the commoner sorts, I believe that the field study method has given an excellent basis for conclusion. For the uncommon forms, such conclusions must still be only tentative.

More than a hundred species are treated as new. This is quite to be expected in view of the previously unstudied nature of the territory and the tendency of evolution to provide unique species in insular locations. Yet there is a problem here, because many students of sponges in the nineteenth century named species with utterly inadequate descriptions and no illustrations or poor ones. An example is found in Kieschnick's descriptions of East Indian species. Many of his descriptions are less than thirty words in total length; some less than twenty words. They are completely devoid of measurements and provide no illustrations at all. If there are any types, their location is unknown. Because of the wars, it may well be that no specimens remain. Some names, thus unrecognizably given, may have been

based on species which also occur in my collections. Yet, how can we ever know which, if any, are thus affected?

The species that are identified here as being already named and described also are open to further inquiry. The prior names thus involved are often based on very scanty descriptions. Were more detailed information to become available about the earlier designation, it might prove to belong to a form which is not really conspecific with my specimens, and in this case the latter should then receive a new name. Because of this situation, I have described all the species equally, not only those called new, but the others as well.

Except where revision is required, genera are not described, nor are families, orders, and classes. Such are discussed and described in the 1936 monograph of the Phylum Porifera by de Laubenfels, Carnegie Institution publication number 467. With a few minor exceptions, the sequence which is employed in that work is also followed here. This should not be interpreted as expressing satisfaction with that classification. It was emphatically characterized as being provisional. Incongruities clearly occur in it. An example is the location of the genus *Oxymycale,* which fits the older diagnosis of the family Desmacidonidae, and is here still left in that family, whereas it is evidently much closer to the genera *Mycale* and *Carmia,* which are in the family Ophlitaspongiidae. Adherence to the 1936 outline is given partly because I feel that this description of Pacific Sponges is not an appropriate medium for extensive taxonomic revision and partly because I am confident that more study, especially physiologic, should precede the admittedly drastic revision that is called for.

For each species a camera lucida drawing is included as a text figure, in order to provide maximum assistance to nonspecialists. In addition, some 25 species are illustrated by photographs.

Descriptions of Species

SUBKINGDOM PARAZOA

PHYLUM PORIFERA Grant
CLASS DEMOSPONGEA

ORDER KERATOSA Grant (or KERATIDA*)
FAMILY SPONGIIDAE Gray
GENUS *SPONGIA* Linné

Spongia officinalis Linné
Subspecies *matamata,* new

Text Figure No. 1
Plate I
Plate II, Figure a

This species is here represented by the following:

U.S.N.M. No. 23200, My No. M. 299, here designated as type, collected June 8, 1949, by a diver (Meling Loeak) at Ailing-lap-lap Atoll from the southwest portion of the lagoon near Bikájela Islet. The depth was 6 meters, and the substrate was dead coral.

U.S.N.M. No. 22933, My No. M. 303, collected on June 11, 1949, by myself, by hand, while wading at Ailing-lap-lap Atoll in the lagoon near Bikájela Islet. The depth was near low tide mark, and the substrate was dead coral.

U.S.N.M. No. 22953, My No. M. 327, collected on June 28, 1949, by diver at Majuro Atoll in the east portion of the lagoon near the Islet called Rita or Jarej. The depth was 4 meters, and the substrate was dead coral.

U.S.N.M. No. 23022, My No. M. 401, collected on July 30, 1949, by diver (David Elio) in Northwest Ponapé from the lagoon about halfway between the reef and the shore. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 22811, My No. N. 017, collected on April 28, 1946, by J. P. E. Morrison at Bikini Atoll, Bokororyuou Islet. The depth was just below low tide, and the substrate, while not listed, probably was dead coral. This species was also collected in 1948 by T. E. Bullock at Bikini Atoll, (my No. N. 101).

This species is abundant throughout Ailing-lap-lap Atoll, and nearly as common at Majuro Atoll, but only near the east end of the lagoon at Majuro. Nevertheless, as at Ailing-lap-lap, *Spongia* is probably the commonest of all Porifera in Majuro waters. It certainly occurs at Bikini, but its relative abundance there is not reported. It was certainly absent when I first came

* A proposal has been made in the publications of Section F of the American Association for Advancement of Science that all class names end in EA, and all orders in IDA. Many paleontologists also favor this uniformity.

Text Figure No. 1. A portion of the fiber of *Spongia officinalis*, subspecies *matamata*, X 182. One of the rare primary or cored fibers shows.

to Ebon Atoll, and quite absent from Likiep Atoll. Presumably reliable reports place it as common at Mejit Island of the Marshalls, and present in scattered others of the islands and atolls of this archipelago. It was present but very rare in Ponapé, only the one small specimen being found there in 1949.

The vertical measurement frequently reaches 15 centimeters, and the diameter 20 cm. The Ponapé specimen consisted of three cones, each 8 cm high, and about 5 cm in diameter at the base, the cones being loosely attached to one another at the base. The indications are that for the first two or more years, the sponge grows in a nearly spherical shape, but thereafter elongate projections begin to rise, which are rather conical than digitate. Many specimens might be described as lobate.

The color of the sponges of this type, if they grow in a fairly bright illumination, tends to be jet black, but an occasional specimen was extremely dark brown (or sepia) rather than blue-black. No connection with ecological placement could be found to account for the fact that some specimens were slightly brownish, nor did they show indications of differing in any other way except color. Specimens which grew in more shaded areas were paler; the more shade the less black. The endosome was regularly drab, not at all reddish. The consistency was, of course, very spongy; in fact, attaining to the very maximum of the quality thus designated.

The surface is finely conulose all over. The conules are somewhat less than 1 mm high and usually between 1 and 2 mm apart. The pores are micro-

scopic and so contractile that in preserved specimens they usually are found to be closed. The oscules are commonly about 1 cm in diameter, but may be as large as 2.5 cm. In the lobate specimens, they are commonly located at the apex of the elevations; in a sponge as much as 15 cm in diameter there will be from 5 to 10 oscules. In the Ponapé specimen there were just three, one for each of the connected cone-shaped lobes. There is no raised rim around the oscules.

The ectosome of this species is a thin dermis about 10 μ thick, and it is noteworthy that it comes loose with extreme ease. One need only squeeze the newly collected sponge a dozen times in the hand, whereupon the skin begins to come loose in large flakes and is soon all removed. From macerating specimens it melts away almost immediately.

The endosome is a typical *Spongia*-type. That is to say, the flagellate chambers are more abundant, crowded more closely together, and more conspicuous than in nearly any other genus of sponge. They are about 20 μ to 30 μ in diameter and are spherical. The entire endosome is permeated by the dense fibro-reticulate skeleton. The ascending fibers of this species are rather scarce, about 40 μ to 50 μ in diameter, and are crowded with small foreign inclusions, such as grains of sand and fragments of foreign spicules. The commoner fibers, which might possibly be called secondary, are about 15 μ in diameter. They outline meshes which are polygonal, but irregular in size, 100 μ being a rather common diameter.

This is obviously a silk sponge of the finest commercial type, very closely related to those which occur near the east end of the Mediterranean Sea. It is so closely related to the type of the genus, *Spongia officinalis,* typical subspecies, that were it not a commercial-type sponge, I should not bother to erect a new subspecific name. This action is taken, however, in order that the distinctive appellation may be available in the literature. The basis of separation may be taken as the tendency to lobate growth, which is less prevalent in Mediterranean sponges.

Comment may be made that this species has the same odor as the related *Spongia* from the West Indies.

The subspecific name is derived from the native Marshallese name for this organism.

Spongia zimocca Schmidt
Subspecies *irregularis* Lendenfeld

Text Figure No. 2

This species is here represented by the following:

U.S.N.M. No. 22882, My No. M. 181, collected on August 1, 1949, by diver in eastern Ponapé (Matalanim) from a reef in the lagoon near an entrance to the lagoon from the open ocean. The depth was 5 meters, and the substrate was (the under side of) dead coral.

U.S.N.M. No. 22884, My No. M. 184, with the same collection data as the preceding.

U.S.N.M. No. 23056, My No. M. 436, collected on August 1, 1949, by hand while wading in eastern Ponapé (Matalanim) near the great ruins of Nan Matal. The depth was barely below low tide, and the substrate was a combination of calcareous sand and leaves of a monocot plant called "turtle grass."

U.S.N.M. No. 23098, My No. M. 480, collected on September 1, 1949, by divers in the Palau archipelago in Iwayama Bay, near Koror. The depth was 2 meters, and the substrate was small bits of dead coral.

U.S.N.M. No. 23135, My No. 518, collected on September 8, 1949, while wading on the west shore of Babeldaub Island, in a bay 5 kilometers north of Ngeremetengel, in the Palau archipelago. The depth was about 1 meter, and the substrate was broken bits of deal coral.

This species is certainly abundant in some portions of Ponapé and the Palaus. I believe it is equally common lear Lemotol Bay in the Truk region, but the only sample which was collected as being presumably of this species from Truk proved instead to be another species. *Spongia zimocca* as found in Micronesia definitely prefers very shallow water (under 2 meters), even where this water must surely become very warm (estimated 35° plus). It thrives in water discolored by emanations from adjacent mangrove swamps, and it endures more mud and silt in the water than do many other sponges.

The shape is basically massive, with large projections on the upper surface. These may be lobate, but typically are elongate cones, each with an apical oscular aperture; they may be more than 10 cm high, and the whole sponge more than 15 cm high. Diameters (of the whole sponge) may exceed 25 cm.

The color of the exterior was regularly black, but that of the interior varied; it might be orange or drab with portions shading into crimson, or (often) drab with portions shading into rusty red. This species frequently emits a typical *Spongia* odor, stronger than the preceding species, but quite like the odor of many freshly collected *Spongias* from the West Indies. The consistency was very spongy.

The surface is conulose, with conules 1 mm high, or occasionally a little less, and 1 to (usually) nearly 2 mm apart. The skeletal pores range from about 100 μ to 200 μ diameter. Each such mesh is filled in with a protoplasmic membrane, pierced by 6 to 10 pores, which are closable and open to a diameter of about 20 μ to 40 μ. The skeletal pores are about 300 μ apart, center to center. The oscules are small and numerous. They range from 2 to 16 mm in diameter and often are only about 3 cm apart center to center. In the lobate specimens they are found on the summits. In fact, it is worthy of comment that they are found in general only on the upper surface of the sponge.

Text Figure No. 2. Fibers of *Spongia zimocca*, X 182. A bit of the abundant network is shown in the foreground; a portion of one of the rare primary or cored fibers in the background.

The ectosome is a thin dermis about 12 μ thick and may be removed with moderate ease. It comes loose spontaneously on macerating specimens.

The endosome is a typical *Spongia*-type, crowded with conspicuous flagellate chambers about 25 μ in diameter. It is, of course, permeated by a dense fibro-reticulation.

The skeleton comprises moderately numerous ascending or principal fibers, about 80 μ in diameter, crowded with foreign debris. The much more common fibers, which may perhaps be called secondary, are about 20 μ in diameter and form polygonal meshes about 100 μ across. They are very irregular in size.

The species *Spongia zimocca* was established by Schmidt 1862, page 23, from the Mediterranean. It also has been recorded as from the Australian and West Indian regions. Commercially, it is commonly referred to as the "yellow" sponge, because the macerated fibers exhibit a somewhat golden yellow or almost orange color. Lendenfeld in 1885, page 485, established a species which he called *Euspongia irregularis.* This is obviously very closely related to *Spongia zimocca* and differs only in that the fibers of *irregularis* are somewhat irregular in diameter from one place to another throughout the length thereof. Therefore, de Laubenfels 1948, page 14, reduced it to a subspecies of *Spongia zimocca.* Sponges of this subspecies appear to be especially common in the vicinity of Australia, and the range also extends into the Indian Ocean and East Indian regions. An important

reference is Wilson, 1925, page 486, where this variety is described as occurring in the Philippine Islands.

GENUS *HIPPIOSPONGIA* de Laubenfels
Hippiospongia communis (Lamarck) de Laubenfels
subspecies *ammata* new

Text Figure No. 3
Plate II, Figure b

This species is here represented by the following:

U.S.N.M. No. 23093, My No. M. 475, here designated as type, collected August 17, 1949, by diver in Kuop Atoll in the lagoon in the lee of Givry Islet. The depth was 4 meters, and the substrate was dead coral.

U.S.N.M. No. 23025, My No. M. 404, collected July 30, 1949, by diver in northwest Ponapé in the lagoon between the reef and the shore. The depth was 5 meters, and the substrate was dead coral.

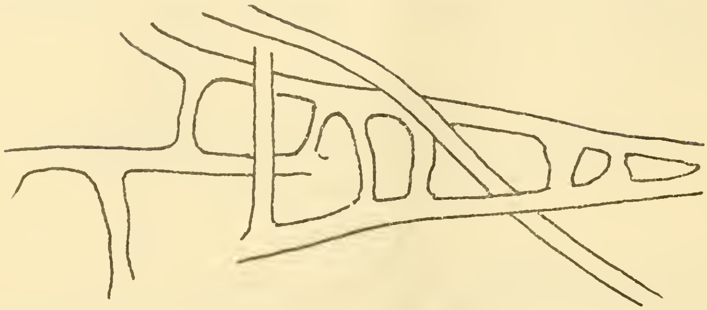
U.S.N.M. No. 23070, My No. M. 450, collected August 10, 1949, by diver near Moen Islet in the Truk lagoon. The depth was 2 meters, and the substrate was dead coral.

This species was common in various places at Ponapé, somewhat less common near the shore than near the reef. It was abundant near Matalanim in northeast Ponapé, and occurred also at Kiti in southwest Ponapé. It was found not only around Moen Islet (Truk) but was common in the west part of Truk lagoon, near Tol Islet. It doubtless occurs throughout the whole archipelago. The finest specimens of all were found to be abundant in Kuop Atoll.

This species is amorphous to massive and reaches a vertical measurement of at least 20 cm and a diameter of at least 70 cm. Specimens 12 to 50 cm in diameter are common.

The color may be cited as gray. When the sponge grows in a more brilliantly illuminated environment, the gray is therefore darker, sometimes nearly, but never quite, black. When the sponge grows in a more shaded environment, the color is paler. The endosome was drab and more uniform in shade than is true of the ectosome. The consistency was extremely spongy.

The surface is quite distinctive. It is conulose with conules which are rounded at the tip, about 1 to (less often) 2 mm in height, and 2 to (more often) 6 or 8 mm apart. These conules are interconnected by conspicuous ridges, so that each appears to be the focus of a stellate or starlike pattern. The pores are 30 μ to 100 μ in diameter and 50 μ to 150 μ apart, center to center. They are often grouped in such a way as to represent skeletal pores of three or four hundred μ in diameter, each comprising about six or eight actual pores, whose partitions are only 20 μ wide. The oscules are quite



Text Figure No. 3. Fibers of *Hippiospongia communis*, subspecies *ammata*, X 182.

irregular and almost certainly can be closed, if not entirely at least to a small fraction of their maximum opening. Some of them were found to be as much as 1 cm in diameter. On the upper surface they may be as little as 3 to 14 cm apart, but large areas of the sponge will lack them entirely. They have no rim and are not raised.

The ectosome of this sponge is extremely tough, at least as durable as leather. It is almost impossible to remove it. It is upwards of 50 μ thick, and is loaded with debris. Sponges of this sort were macerated in bacteria-filled water for 2 months, at the end of which time the dermis showed practically no signs of disintegrating or weakening at all, and still needed to be cut off with a knife. There are a few large ramifying subdermal spaces. Over them the dermis is broken rather easily, but still it remains firmly attached to the regions between these subdermal canals.

The endosome is crowded with numerous spherical flagellate chambers about 20 μ in diameter and is also permeated densely with a fibro-reticulation. In this species, as is to be expected in the genus *Hippiospongia*, the so-called ascending fibers are extremely rare. In specimen number M. 450, one was finally discovered. It was some 80 μ in diameter and loaded with foreign material. The common fibers are very thin in spite of their strength, only a few being more than 20 μ in diameter. Diameters of 9 μ to 17 μ are the rule. The meshes are extremely irregular in outline and size, but more often about 100 μ in diameter than other sizes. In places they exhibit a ladderlike or almost fascicular pattern.

The most typical specimens of *Hippiospongia* are those from the West Indies. The genus has been sharply set off from *Spongia* by its possession of large, extensive subdermal canals. These are not highly developed in the European species *communis* nor in this variety of that species as reported from the Pacific area. It is referred to the genus *Hippiospongia* rather than *Spongia*, however, for many reasons. It does have the large subdermal canals. It has the very resistant and firmly attached dermis. The comparative lack of so-called ascending fibers is noteworthy. This new subspecies

differs only slightly from the typical variety as found in the Mediterranean region, described as *Spongia communis* by Lamarck, 1814, page 370. Because it is a potentially valuable commercial form, and therefore likely to be referred to frequently in such a manner as to require differentiation from the Mediterranean form, it seems advisable to give it a name at this time. The basis for separation is admittedly a small one. In the Pacific form there are exceptionally conspicuous ridges between the conules, forming a noteworthy stellate pattern on the surface.

The subspecific name is derived from the native name for this organism.

Hippiospongia metachromia new

Text Figure No. 4

This species is represented here by the following:

U.S.N.M. No. 23123, My No. M. 505, here designated as type, collected on September 2, 1949, by diver in the Palaus northwest of Koror in the lagoon near Ngarebgal Islet. The depth was 3 meters, and the substrate was dead coral.

This species appears to be rare; only the one specimen was found.

This is a massive sponge, 14 cm high and 22 by 30 cm in horizontal measurement.

In life the exterior was brilliant yellow, and the endosome would have been the same color, except for the modification thereof by an obviously abundant reticulation of amber-colored fibers. After dying, either in the air or in alcohol, the sponge very slowly turns dark purple. It required 5 minutes to see any obvious change, and 5 hours for the maximum change. The odor in life was that of the characteristic West Indian *Spongia* and *Hippiospongia*. The consistency was stiffly spongy.

The surface is typical for the genus *Hippiospongia*. There is an obvious fleshy dermis, about 20 μ thick over large, extensive subdermal cavities. In the islands between these ramifying cavities or canals, the surface is covered with sharp conules about 3 mm high and 6 mm apart. The pores are microscopic and close quickly. The oscules are difficult to study, because the specimen contained a large number of openings which are probably accidental. Yet, some must be oscules. Probably none are much more than 1 cm in diameter. All are irregular in outline and inconspicuous.

The ectosome (as already mentioned) is a sharply differentiated dermis closely adherent to the underlying tissues and removable only with great difficulty (which is characteristic for the genus). The endosome is densely crowded with spherical flagellate chambers, 25 μ to 30 μ in diameter, and is full of a fibrous reticulation.

No ascending or cored fibers could be located at all; the only type present is that which is sometimes termed secondary. These fibers were rather uni-

Text Figure No. 4. Fibers of *Hippiospongia metachromia,* X 182.

form in diameter, about 50 μ, and they formed rounded small meshes, about 100 μ to 200 μ in diameter. As in *Spongia* and other *Hippiospongias,* these fibers consist of amber spongin without inclusions.

This is in all respects a much more obvious *Hippiospongia* than is *Hippiospongia communis.* In fact, it differs from *Hippiospongia lachne* only in consistency and color. *Lachne* is a West Indian sponge of great commercial value, and its fibers are extremely elastic. Those of *metachromia* are, in contrast, so stiff that this should not have any commercial use. The conspicuous change in color from yellow to purple was noticed long ago in sponges of the genus *Verongia.* After many years it was reported in a species of the genus *Aplysilla.* Recently a number of additional genera, in various families, each proved to have one or more species characterized by this peculiar transformation, which is associated both with change in pH and in oxidation-reduction chemistry. *Metachromia* is the only species of *Hippiospongia* to have this color change, which is reflected in the specific name which has been selected.

GENUS *HETERONEMA,* Keller

Heteronema eubamma, new

Text Figure No. 5

This species is represented by the following:

U.S.N.M. No. 23082, My No. M. 464, collected on August 13, 1949, while wading in the west part of Truk lagoon, south of Pollé Island. This was near mangroves in very shallow water, less than 30 cm deep. The substrate was coral sand, contaminated with mud.

This is a subspherical sponge, 15 cm high and 15 cm in diameter. The color of the ectosome in life was jet black, glistening and shiny. The endosome was drab, with here and there a small brick-red area. These reddish patches gave indications that the sponge was in poor condition, perhaps pathological or even moribund. The consistency was very spongy.

The surface is conulose with conules 1 to 2 mm high and 3 to 4 mm apart and very sharp in outline. The pores are 40 μ to 80 μ in diameter and 100 μ to 200 μ apart, center to center. The oscules occurred only on the upper surface of the specimen and proved to be very contractile. They were certainly about 1 cm in diameter when fully expanded but are much smaller in the preserved specimen. They are numerous and scattered.

The ectosome is fleshy and adherent, not easily removed. It contains little or no debris. The endosome shows an obvious fibro-reticulation, so coarse that it can be studied with the naked eye. As studied with the microscope in section, the interior of the sponge proves to contain much mesogloea or jelly. Numerous typical flagellate chambers occur; they are spherical and 25 μ in diameter. Groups of large cells are seen, each cell upwards of 20 μ in diameter. These almost certainly are ova, although another possibility is that they may already be zygotes.

The ascending fibers are often as much as 50 μ in diameter, but some are smaller. They are interconnected by smaller ones, some of these as little as 20 μ in diameter. Practically all are densely packed with foreign material, chiefly fragments of spicules. After long search, one small fiber was discovered to be free from such inclusion, but obviously was freakish.

The only other species of the genus *Heteronema* so far erected, is *H. erecta* Keller 1889, page 340, from the Red Sea. Obviously this is related very closely to *eubamma,* but there are a number of differences. *Erecta* was

Text Figure No. 5. A portion of the fibrous skeleton of *Heteronema eubamma,* X 182.

digitate and its conules smaller. It is not described as possessing the peculiar jelly which is regarded here as rather characteristic. Some possibility exists that the specimen of *eubamma* as collected was in somewhat unusual condition because of active reproduction at the time of collection.

Row 1911, page 369, reviewed the genus. He and Keller comment on the extent to which *Heteronema* is very like the genus *Spongia* with the only exception that the secondary fibers, as well as the primaries, are cored with foreign material. It is noteworthy that *eubamma* (as collected in Truk) in the field was presumed to be a *Spongia*. It felt as well as looked like a *Spongia*. In the above discussion of *Spongia zimocca* the statement is made that that species probably was common in the western portion of Truk lagoon. A principal reason for the lack of specimens of *zimocca* is that the specimen thought to be *zimocca* proved to be *eubamma*. Further study in the field would be necessary to make certain whether or not the other numerous sponges in the vicinity were all *Heteronemas* or (probably) many of them *Spongia zimocca*.

The species name is derived from the Greek term meaning well-dyed or colored.

GENUS *AULENA* Lendenfeld

Aulena concertina new

Text Figure No. 6

This species is here represented by the following:

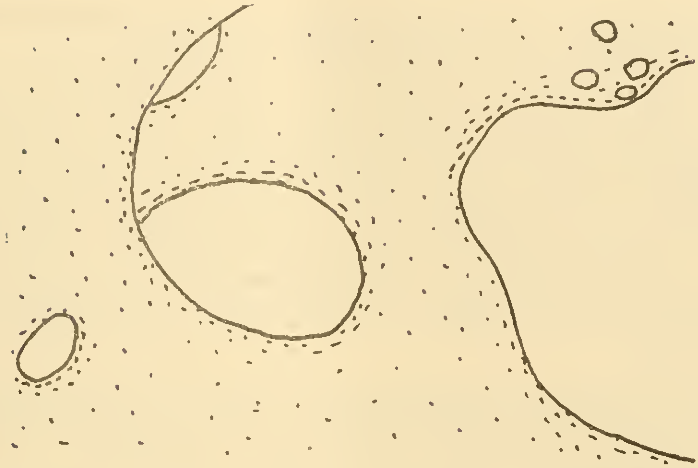
U.S.N.M. No. 22941, My No. M. 311, collected on June 20, 1949, by diver at Ailing-lap-lap Atoll in the channel just east of Bikájela Islet. The depth was 10 meters, and the substrate was dead coral. Many conspecific specimens were collected and more observed in this limited region.

This species is ramose with very few branches and usually lies repent rather than erect. The branches often extend to a total length of more than 10 cm and are about 7 mm in diameter.

The color in life was dark purplish-gray on the exterior but pale drab, almost white, on the interior. The consistency was spongy.

The surface is finely conulose with conules only about 0.3 mm high. There are about two such for each square mm of surface. The pores are 30 μ in diameter, abundant and scattered, say 150 μ to 750 μ apart, center to center. Oscules could not be located; perhaps some of the small openings which were regarded as pores may really have been exhalant.

The ectosome of this sponge is loaded with foreign spicules and sand particles often 10 μ to 20 μ in diameter. The total thickness of the skin is about 80 μ; it is detached very easily. The endosome is characteristic of the unique genus *Aulena* in that it consists of peculiarly fenestrated trabeculae or sheets through which the flagellate chambers show as though they were holes



Text Figure No. 6. A portion of the fibrous skeleton of *Aulena concertina,* X 182.

punched in it. Actually they are rounded in outline, almost spherical, and 20 μ in diameter.

The type of the genus, *A. villosa* (from Australia), is pronouncedly villous. *A. columbia* (from the West Indies) is not villous and is in many ways more like *concertina,* but is a massive species (whereas *concertina* is ramose). *A. laminaefavosa* (from the Australian region) is closest to *concertina,* being also somewhat ramose and having much foreign material in the ectosome. On the other hand its surface is described as being smooth. It cannot be regarded as well-known, in spite of the fact that much has been written about it. Study of type material is necessary, and after such study it might prove to be the case that *concertina* would fall in synonymy to *laminaefavosa.* This latter was named first by Carter in 1885, page 212, as *Holopsamma laminaefavosa,* but was described very briefly. Lendenfeld in 1885, page 285, and again 1889, page 457, devoted many pages to this sponge, but said many things so contradictory and in many cases so obviously incorrect that the situation thereby is rendered less clear, and the need for further study of Australian specimens is emphasized.

GENUS *PHYLLOSPONGIA* Ehlers

Phyllospongia lekanis new

Text Figure No. 7
Plate III, Figure b

This species is here represented by the following:

U.S.N.M. No. 23109, My No. M. 491, the type, collected on September 1, 1949, by divers in Iwayama Bay, Koror, in the Palau Islands. The depth was 2 meters. The substrate was usually dead mollusk shells.

Other specimens were collected dry, and very numerous ones were studied alive in the field, all in the Palau Archipelago.

This species takes the shape of a very shallow, obtuse cone or platter. Actually, this is formed as a spiral, which overlaps so that a nearly perfect cone results but with the spiral shape still obvious; the angle of opening is often about 150°. The angle of the cone is more acute in younger, smaller specimens than in older, larger ones. The total diameter reaches at least 55 cm. The walls are rather uniformly about 3 mm thick, regardless of the diameter of the whole sponge. The point of attachment, even of a very large specimen, may be as little as 3 cm in diameter. It is practically sessile, without stalk.

The color in life was a dull ochre or drab, both on exterior and interior. The consistency was very spongy and tough and astonishingly is still spongy in dry specimens, indicating the relationship of the material of the fibers to that of *Spongia* itself.

The surface in life is nearly smooth, but there are (in many places) shallow grooves, representing subdermal cavities into which the very thin surface membrane has collapsed. These are exaggerated in dry specimens on which they appear as grooves a little less than 1 mm wide and deep and a little more than 1 mm apart, center to center. In other regions of irregular

Text Figure No. 7. A portion of the fibrous skeleton of *Phyllospongia lekanis*, X 182. The section is perpendicular to the surface, which is illustrated near the top of the figure. Bits of two of the ascending (cored) fibers show.

outline and distribution, the dermis is much thicker and continuous. The pores are represented by numerous small openings about 30 μ in diameter through these dermal membranes. The oscules are noteworthy and conspicuous; each is round, about 1 mm in diameter, and surrounded by a very dense area devoid of pores, which area is about 4 or 5 mm in diameter and is raised one or more mm above the surface of the sponge. Most remarkable of all, these oscules are nearly as numerous on the outside of the sponge as they are on the inside. Those which occur on the outside are even more conspicuous than are those which occur on the inside. In the latter location they are rather uniformly distributed, a little more than 1 cm apart, whereas on the outside considerable areas are devoid of oscules, while in other places they are less than 1 cm apart.

The ectosome is uniformly characterized by foreign material, but over the outside of the sponge it is scarcely more than 10 μ thick, and the debris is very fine. On the inner surface of the sponge, instead of being uniformly distributed, as it is on the outside, the cortexlike dermis is irregularly distributed. In places, even in the living sponge, it can scarcely be found, and the subdermal canals are fully exposed. Yet on nearly half the interior surface it is present, and upwards of 0.5 to 1 mm thick. These areas are loaded with coarse foreign material. The endosome is crowded densely with a fibrous reticulation. The flagellate chambers proved difficult to study because of the abundance of fibers, but they are certainly small and spherical.

There are abundant ascending or principal fibers widely scattered throughout the sponge, often about 150 μ in diameter and about 500 μ apart. These are loaded with foreign material. They are interconnected by even more abundant secondary fibers, which are devoid of debris and are only about 50 μ in diameter. These form meshes which are from 50 μ to 100 μ in diameter, rounded in outline, and which leave little space free from their presence.

This species is characterized chiefly by its shape. The abundance of oscules on the exterior of the cone also is remarkable and is not equalled in any other species in the genus. The nature of the fibers brings this species into obvious relationship with some members of the genus *Spongia,* particularly *Spongia thienemannia* (Arndt 1943, page 381). This is the Philippine "Elephantear" sponge and is much like *lekanis* in most respects. The latter, however, has the debris-filled dermis which characterizes the genus *Phyllospongia* and, in comparison with Arndt's excellent illustrations, reveals significant differences in the pattern made by the fibers.

The species name is derived from a Greek word meaning "platter."

Phyllospongia complex new

Text Figure No. 8
Plate III, Figure a

This species is here represented by the following:

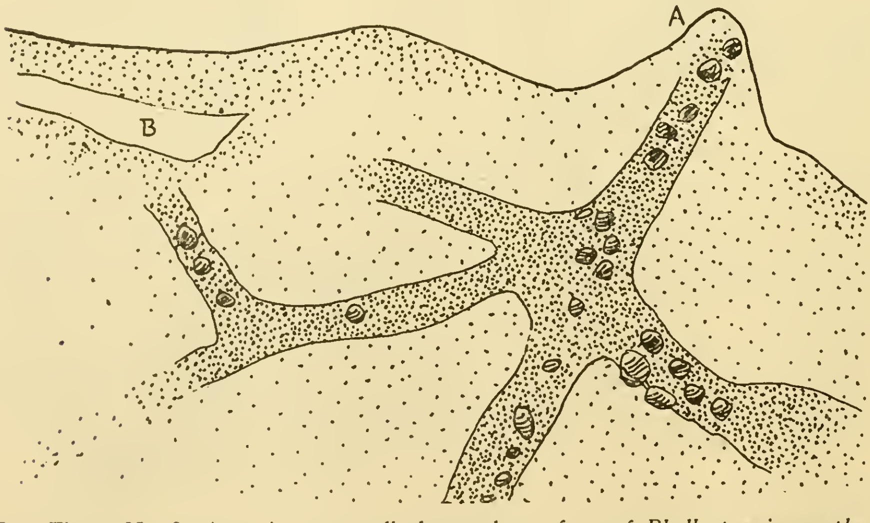
U.S.N.M. No. 23110, My No. M. 492, here designated as type, collected on September 1, 1949, by divers in Iwayama Bay, Koror, in the Palaus. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 23127, My No. M. 510, collected on September 6, 1949, by means of a fish spear in Iwayama Bay, Koror, in the Palaus. The depth was less than 2 meters, and the substrate was coral debris.

This species also was studied by numerous specimens, some preserved by drying and some not preserved. It was abundant in the shallow water of lagoons in the Palau archipelago. In some places, it was nearly the only sponge present. Almost every square meter had its specimen.

This species consists of erect wall-like sheets or leaves, 1 to 2 mm thick. The walls are 3 to 5 cm tall and arranged to form a labyrinthine pattern or to outline many small roofless rooms. In the latter case, there are many places where the walls join at angles approaching 90°. The whole structure of scores of rooms and passages is frequently about the size of a dinner plate —say 15 to 25 cm in diameter. The rooms or passages are often 2 to 3 cm wide.

The color in life was dull medium green, both on exterior and interior. The consistency was very spongy.



Text Figure No. 8. A section, perpendicular to the surface, of *Phyllospongia complex*, X 182. One of the surface conules shows at *A*, and a subdermal space at *B*. Part of the fibrous network is also illustrated.

The surface is conulose with conules 0.5 mm high and 1.5 mm apart. The pores are microscopic and usually closed. The oscules are 1 to 2 mm in diameter, round, and on the upper edge of the sheet. They most frequently occur at the places where the sheets come together: at the corners of rooms, so to speak.

The ectosome is a debris-filled dermis about 200 μ thick and very similar on both sides of the sheet. The endosome is densely filled by a fine-mesh fibro-reticulation with small, round, flagellate chambers.

The skeleton consists of primary fibers about 75 μ to 150 μ in diameter, containing some foreign material, and also of abundant secondary fibers about 25 μ in diameter, devoid of debris. These make a close-meshed reticulation with round openings only about 100 μ to 200 μ in diameter.

Within the genus *Phyllospongia,* the species *complex* is unique for its shape, although the subspecies *polyphylla* of the species *papyracea* forms a lettucelike mass of leaves. These do not form rooms in *polyphylla,* and the oscules are on the surfaces rather than on the edges or rims. Yet, there is a precedent for the shape of the species *complex.* In 1885, page 301, Lendenfeld described *Halme simplex* from Australian waters and figured exactly such an architecture (Monograph of Australian sponges, plates 26 and 27, also see de Laubenfels, 1948, page 41), but on a finer scale and with walls only about 1 cm high. Lendenfeld reports fibers scarcely cored with foreign material and does not describe a debris-filled dermis. Therefore, de Laubenfels, 1948, page 40, placed this in the genus *Hyattella.* As E. F. Hallmann has made very clear, Lendenfeld's descriptions are not merely verbose and obscure but definitely unreliable, being replete with purely imaginary details. Were specimens of his *simplex* available, it is conceivable that they might prove to be congeneric, or even conspecific with *complex.* On the other hand, they might prove to be even farther removed than seems to be the case.

The species name refers to the complex shape of this species.

GENUS *POLYFIBROSPONGIA* Bowerbank

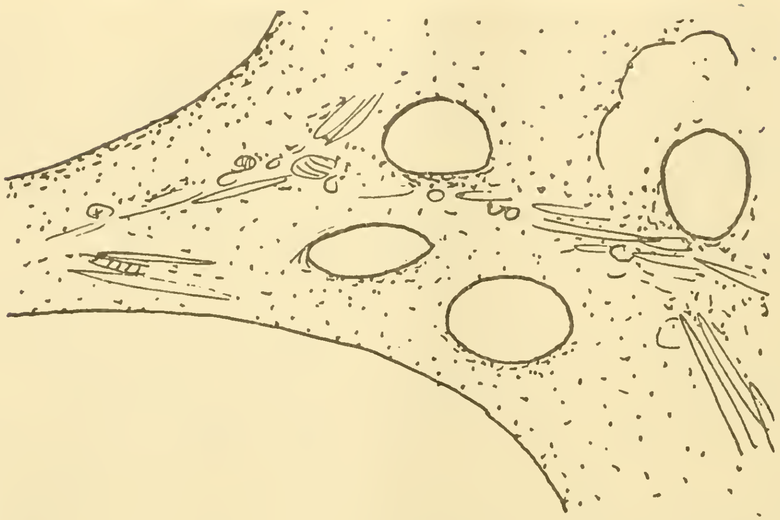
Polyfibrospongia dysodes new

Text Figure No. 9

This species is here represented by the following:

U.S.N.M. No. 23136, My No. M. 519, here designated as type, collected on September 8, 1949, by hand while wading in a bay on the west coast of Babeldaub Island of the Palaus, 5 kilometers north of Ngeremetengel Bay. The depth was less than 1 meter, and the substrate was mixed coral debris and mud.

The abundance of this species is not easily gauged, because of its superficial resemblance to *Spongia zimocca.* The two, conjointly, were abundant



Text Figure No. 9. A portion of the fascicular fibrous skeleton of *Polyfibrospongia dysodes,* X 146.

at the point of collection. I believe that the vast majority of the specimens were *Spongia* and that *Polyfibrospongia* was the less common one.

This is an irregularly massive sponge about 10 cm high and 13 cm in diameter. The external color in life was dark gray, and the endosome was drab. This species gave off to a noticeable extent the characteristic odor of the genus *Ircinia* as studied in the West Indies. Its consistency was very spongy, but it was easy to cut this sponge. This is not true of the genus *Ircinia,* which can be cut (even with a sharp knife) only with difficulty.

The surface was conulose, with conules 1 mm high and 3 to 4 mm apart. The pores are microscopic and closed. The oscules are about 6 mm in diameter, not conspicuous.

The ectosome is a thin, fleshy dermis, as in *Spongia.* The endosome is dense, crowded with flagellate chambers about 25 μ in diameter and spherical; these also resemble the flagellate chambers of *Spongia.* The endosome is crowded with a reticulation of fibers, but these are much coarser than are those in *Spongia.*

The skeleton consists of ascending fibers which are pronouncedly fascicular. It is very difficult to measure them, because they blend into the surrounding reticulation somewhat, but they approximate 500 μ in total diameter. The transverse fibers are about 100 μ in diameter, and they (as well as the ascending tracts) are loaded with foreign debris. The mesh is very coarse, with openings about 1 mm in diameter.

Several species of *Polyfibrospongia* have been recorded from the southwestern Pacific, notably *P. sweeti,* Kirkpatrick, 1900, page 359, from Funafuti Atoll. This is extremely different from *dysodes,* being smooth and white. Other species of this genus are pronouncedly fistulose or characterized by notable external shape—for example, the genotype *flabellifera* which is fan-shaped. Undoubtedly, the other species closest to *dysodes* is *P. echina* de Laubenfels, 1934, page 25 (described from Puerto Rico in the West Indies and also by de Laubenfels, 1936, page 15, from the Dry Tortugas in the same part of the world). This species resembles an *Ircinia strobilina* but lacks the special filaments of an *Ircinia.* The species *dysodes* bears its closest external and tactile relationship to *Spongia zimocca.* In fact, the diver who collected it definitely stated that in his opinion it was that particular commercial sponge which the Japanese had harvested and planted at the place of collection. Numerous specimens of *Spongia zimocca* were found around the one specimen of *dysodes,* and until histological study was made, it was impossible to discriminate between the *Spongias* and this *Polyfibrospongia.* Upon maceration for later commercial use the difference would become quite evident.

The specific name is derived from a Greek word meaning "ill-smelling."

GENUS *IRCINIA*

Ircinia strobilina (Lamarck) de Laubenfels subspecies *irregularis* (Poléjaeff) de Laubenfels

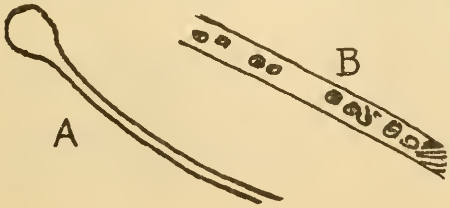
Text Figure No. 10

This species is here represented by the following:

U.S.N.M. No. 23133, My No. M. 516, collected September 6, 1949, by means of a fish spear, in Iwayama Bay, near Koror, in the Palaus. The depth was 2 meters, and the substrate was bivalve shells.

This is an irregularly massive sponge, 10 cm in height and 15 by 20 cm in horizontal measurement.

The external color varied from gray to black, depending upon the amount of illumination falling upon it. The endosome in life was dark brick red. This sponge gave off to a very striking degree the odor which is characteristic of the genus *Ircinia* as found throughout the West Indies. The con-



Text Figure No. 10. Structures from *Ircinia strobilina,* subspecies *irregularis,* X 781. *A:* Termination of one of the filaments. *B:* Portion of one of the strands which may be algal.

sistency in life and while wet was very spongy, but this sponge is extremely hard to cut even with a very sharp knife, exactly like all typical specimens of the genus *Ircinia.* Similarly, when dry, it is as hard as wood.

The surface was much overgrown by a specimen of *Phyllospongia;* but where not so covered, there are conules 2 mm high and 3 to 4 mm apart. The pores are small, contractile, and quickly closed. The oscules are 3 to 8 mm in diameter and crowded throughout the upper surface of the sponge, about 1 to 2 cm apart.

The ectosome is a thick, fleshy dermis about 100 μ thick and is loaded with debris, which consists mostly of foreign spicules. The endosome is typical of the genus *Ircinia,* somewhat cavernous, but otherwise fairly densely crowded with small, spherical, flagellate chambers and permeated by a fibroreticulation. It is filled even more densely with characteristic filaments.

The skeleton of this species is characterized by fascicular ascending fibers more than 1 mm in total diameter and by connective fibers of very irregular size, often about 100 μ in diameter. Most of the fibers contain foreign material. The *Ircinia* filaments are especially interesting in this species. Many of them are quite typical, about 2 μ in diameter throughout most of their length with very large, round, terminal knobs 8 μ in diameter. The total length is (as usual) very difficult to estimate but is probably more than 1 mm. Among them are numerous other strands, or filaments, 3 μ to 5 μ in diameter. The latter are full of irregularly distributed, round, green objects, about 1 μ to 2 μ in diameter, which certainly appear to be chloroplasts. These strands, in hematoxylin-stained material, do not take the lavender color as the clear-cut *Ircinia* filaments strikingly do. One is inclined to conclude that the somewhat larger strands represent symbiont algae. It is stated in the literature that no incipient or partially formed *Ircinia* filaments ever have been found. It is noteworthy that there are no records of such juveniles. It might be true that first of all the sponge entertains symbiont algae, digests the protoplasmic portion of them, brings about a chemical change in the cellulose walls that remain, and thus produces the *Ircinia* filaments. On the basis of this hypothesis, the sponge does not build up the filament from a thinner strand (such as is never found) but reduces it from a thicker strand of very different initial appearance. Confirmation is found in the well-known fact that the chemical composition of typical *Ircinia* strands is not identical with that of the keratose fibers of the reticulation. The fibers may be dissolved in a strong caustic, which leaves the filaments much less affected, and the reaction to staining likewise is different.

This sponge was first described as *Cacospongia irregularis* by Poléjaeff in 1884, page 63, from Australia. A discussion of its subsequent varied taxonomic fate may be found on page 73 of de Laubenfels, 1948, Monograph of the order Keratosa.

Ircinia ramosa (Keller) de Laubenfels

Text Figure No. 11

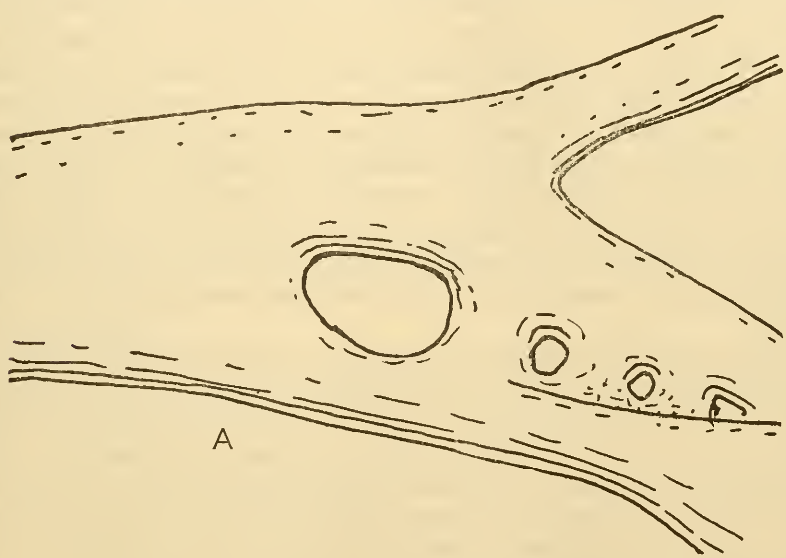
This species is here represented by the following:

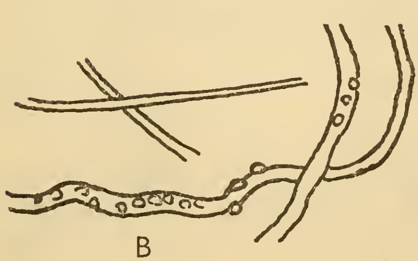
U.S.N.M. No. 23106, My No. M. 488, collected on September 1, 1949, by divers in Iwayama Bay, Koror, in the Palaus. The depth was 2 meters, and the substrate dead coral.

U.S.N.M. No. 23053, My No. M. 433, collected on August 1, 1949, by diver in eastern Ponapé (Matalanim) from a reef in the lagoon, near an entrance to the lagoon. The depth was 5 meters, and the substrate was dead coral.

This species was found to be present, but not common, in Ponapé, but it appeared to be widespread and common about Koror.

The shape of this sponge is, as the name implies, ramose, and the Palau Islands specimens are quite typical, about 1 cm in diameter of branches. The total height reaches as much as 20 cm. The rarer specimens from Ponapé were not at all typical but were small irregular masses. They are identified





Text Figure No. 11. *A:* Portion of the fascicular fiber of *Ircinia ramosa,* X 182. *B:* Filaments X 781; bits of normal filament at the upper left; those that may be, or may have been, algal, at the right.

as being *ramosa* only with considerable hesitation. Because of the small size and agreement in internal characteristics, it is considered preferable to identify them thus rather than to erect a new species, and certainly they cannot be placed readily in any other existing species with greater confidence than in *ramosa*.

The color in life was ochre to olive brown, with a somewhat paler but similarly tinted endosome. The consistency was very toughly spongy, flexible, but extremely hard to cut, as is true of all members of this genus.

The surface is conulose, covered with conules 1 to 2 mm high and 3 to 5 mm apart. The pores are approximately 100 μ in diameter and about 300 μ apart, center to center. The oscules cannot be found; therefore, one must surmise that some of the small openings may be exhalant, as well as others being inhalant.

The ectosome is a thin, tough dermis. The endosome is quite typical of the genus, with abundantly crowded spherical flagellate chambers about 30 μ in diameter and with an obvious fibro-reticulation also present.

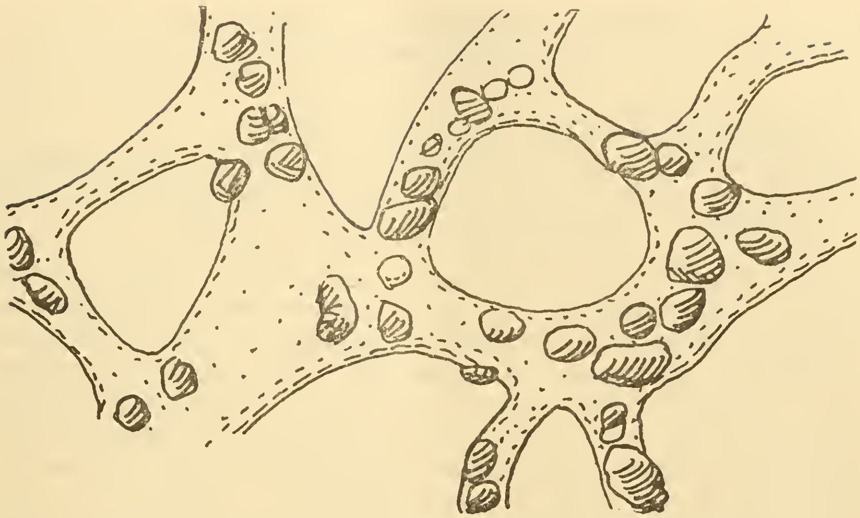
The skeleton consists of ascending fascicular tracts of fibers, 200 μ and more in diameter. The constituent fibers which make up these fascicles are about 80 μ in diameter, and the connective fibers may be a little smaller, say 50 μ in diameter. All of them contain more or less foreign debris. There are also very numerous *Ircinia* filaments present, only about 2 μ in diameter. It is noteworthy that in this species, both as collected in Ponapé and in Koror, there are present, along with the undoubted *Ircinia* fibers, slightly larger strands containing scattered round greenish bodies that resemble chloroplasts. In other words, this species also apparently contains symbiont algae. It is very easy to surmise, when studying sections of these sponges, that the *Ircinia* filaments represent partially digested and chemically altered algal strands.

Ircinia ramosa was described as *Hircinia ramosa* by Keller, 1889, page 345, and transferred to *Ircinia* by de Laubenfels, 1948, page 73. It is characteristic not merely for its ramose form but for the very slender filaments, similar to those which are present in these sponges from Micronesia. The type specimen was from the Red Sea, but the species may be circum-equatorial, as it is recorded by de Laubenfels, 1934, page 24, from the West Indian region. In color and in every other respect the Palau specimens are quite typical of those found in other parts of the equatorial oceans.

Ircinia halmiformis (Lendenfeld) de Laubenfels

Text Figure No. 12

This species is not here represented by any specimen. In the summer of 1948, however, it was collected by Dr. T. E. Bullock within the region here discussed. He collected two specimens from Bikini Atoll in the Mar-



Text Figure No. 12. Portion of the skeletal network of *Ircinia halmiformis,* X 182.

shall Islands (his specimens C37A and C101) and at least one specimen from Eniwetok Atoll in the Marshall Islands (his specimen Z1).

These specimens from the Marshall Islands may be described as consisting each of a basal sheet, 3 to 5 mm thick and often as much as 4 cm square. On this, ridges 7 mm high and 2 to 3 mm thick arise. These ridges are arranged in a highly complicated or labyrinthine manner. The deep valleys between them are only 1 to 3 mm wide.

When preserved in alcohol, the color is drab. The consistency is spongy, but it is easily cut, a remarkable factor when compared to other species in the genus *Ircinia.*

The surface is microconulose but very complicated. The pores are closed, but oscules appear in considerable numbers on the surfaces of the labyrinthine ridges. They are usually much less than 1 mm in diameter, often only 2 to 7 mm apart.

The ectosome is a fleshy dermis, about 20 μ thick. The endosome is a fibro-reticulation and contains numerous typical *Ircinia* filaments.

The skeleton, as already noted, contains filaments, in this case 2 to 3 μ in diameter. The fibers contain rather large foreign material, sand grains often as much as 50 μ in diameter. The total fiber diameter ranges from 30 to 80 μ. Where it is arranged in ascending fascicles, the latter are often about 200 μ in diameter.

This unique species was first described as *Hircinia halmiformis* by Lendenfeld, 1888, page 183, from the Australian region. The agreement of the Marshall Island specimens with those of Lendenfeld is astonishingly close.

GENUS *SPONGIONELLA* Bowerbank
Spongionella chondrodes, new

Text Figure No. 13

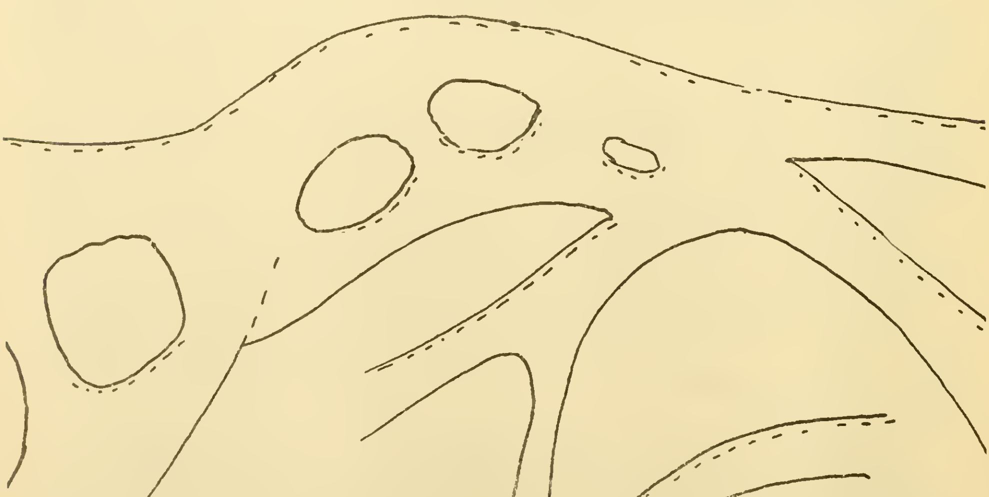
This species is here represented by the following:

U.S.N.M. No. 23112, My No. M. 494, here designated as type, collected September 1, 1949, by divers at Iwayama Bay near Koror in the Palaus. The depth was 2 meters, and the substrate was dead coral.

This sponge was not common, but on September 6, 1949, two more specimens were discovered. This sponge might be said to be laminate, but the walls, which are about 1 cm thick and 5 cm high, form a labyrinthine pattern enclosing walled rooms and zig-zag passageways. The total structure is 30 cm in diameter. One of the specimens found on the 6th of September had many of the rooms so nearly circular that a tubular appearance was approximated. In the field this does not look like a sponge and was collected with grave doubt as to its poriferan nature.

The color in life was dull grayish drab, fading in alcohol to nearly white. The interior was of the same pale color. The consistency was very much like that of cartilage or stiff jelly.

The surface is smooth, shining, and slippery to the touch, practically imperforate. Even under the microscope, pores could not certainly be found, though several spots were located which seemed to represent completely closed pores. The oscules were discovered, however. They have a diameter of 1 to 2 mm and are widely scattered, 3 to 13 cm apart. They were on the ridge or upper edge of the walls.



Text Figure No. 13. A portion of the fibrous skeleton of *Spongionella chondrodes,* X 182.

The ectosome consists of a cartilage-like cortex about 1 mm thick, but not readily detached or separated from the underlying material. In the endosome, brown fibers show plainly to the naked eye in a ground mass or matrix of jelly. When the latter is studied in thin histologically prepared sections, one finds here and there scattered clusters of typical flagellate chambers 25 to 30 μ in diameter; but even larger areas of the jelly are totally devoid of any flagellate chambers. Widely distributed, but particularly abundant in these areas which do not have chambers, are numerous embryos, at first thought to be sand grains because of their pale color. They are about 240 to 300 μ in diameter. Perhaps the unusual histological conditions, as evidenced by the lack of flagellate chambers in many regions, may be due to the fact that the sponge was in a particularly active stage of reproduction at the moment of collection.

The skeleton consists of a reticulation of clear, stratified fibers, but without any central pith. Some, which may be regarded as primary, are as large as 70 μ in diameter. More of them are as small as 30 μ. The meshes are exceedingly irregular in size and shape; some are small and round, scarcely 40 μ in diameter. There are all intergradations between these and larger polygonal meshes 200 to 300 μ in diameter.

There are three other species now in the genus. Of these, *hermanni* is not at all well known, and *tubulosa* is characterized by a definite tubular shape. This latter was described by Burton, 1937, page 42, from southern India. Closest to *chondrodes* is the type of the genus, *S. pulchella,* described as *Spongia pulchella* by Sowerby, 1806, page 87. This is a laminate species from deep water in the North Atlantic, and its soft parts are particularly ill known. Its skeleton is much more regularly reticulate than that of *chondrodes,* and there is no indication that it has the peculiar cartilage and jelly.

The species name *chondrodes* is selected from a Greek word for "cartilage."

GENUS *DRUINELLA* Lendenfeld

Druinella tyroeis, new

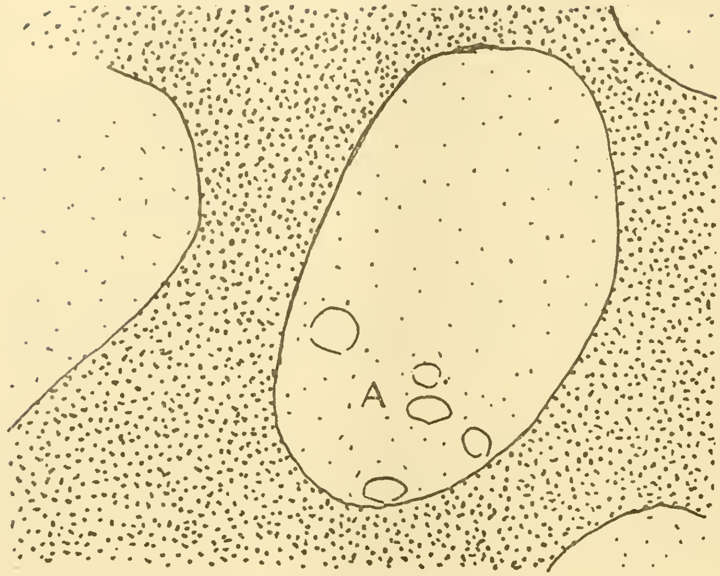
Text Figure 14

This species is here represented by the following:

U.S.N.M. No. 23052, My No. M. 431, here designated as type, collected on August 1, 1949, by diver in eastern Ponapé (Matalanim) from a reef in the lagoon near an entrance to the lagoon. The depth was 5 meters, and the substrate was dead coral.

Other specimens of this sort were studied in the lagoon of southwest Ponapé (Kiti) on August 3, 1949, but not preserved. The species, however, is definitely not common.

This is an incrusting sponge, 7 mm thick, covering about 5 square cm.



Text Figure No. 14. Surface view of *Druinella tyroeis,* X 182. The dermal fiber shows, outlining one skeletal pore and portions of three others. Near *A* appear five of the real or protoplasmic pores piercing the dermal membrane.

The color in life was white, tinged slightly with yellow, but the sponge has darkened to walnut brown after several months preservation in alcohol. The color of the endosome was the same as that of the exterior. The consistency was exceedingly like that of cheese, both when felt and when cut by a knife.

The surface is conulose, the conules 1 to 3 mm high and about 4 mm apart. The skeletal pores show plainly to the naked eye and are about 350 μ in diameter, about two of them for each square mm of surface of the sponge. These skeletal pores are filled in with protoplasmic membranes, within which finer pores appear. The latter close quite readily, are round when opened, and are 20 μ to 40 μ in diameter. They are very irregularly distributed inside the membrane or skeletal pore, considerable regions of each such membrane being devoid of openings. The oscules are not set apart from inhalant openings and therefore are confused with them.

There does not seem to be any all-pervasive ectosome in this species, but a dermal membrane may be considered as being represented by the abovementioned protoplasmic sheet, which fills in the skeletal pores. The endosome is very dense, both with flesh and fibro-reticulation. It contains scattered foreign spicules. The histological structure is quite remarkable. The flagellate chambers are very small, only about 20 μ in diameter, and are absent from considerable areas. These areas are full of strands, 6 μ in diameter,

many of which are the exceedingly long meandrine canals leading to or from the flagellate chambers. Others of the strands are probably symbiont algae.

The skeleton comprises principal fibers which are about 150 μ in diameter near the surface of the sponge, and become gradually larger until in the deeper portions they reach a diameter of 500 μ. These are of clear yellow spongin, pronouncedly laminate, and they usually (but not always) contain a central core, which is filled with foreign debris.

There are two other species in this genus: the type is *Druinella rotunda* Lendenfeld, 1889, page 427, from Australia, and the other was first described as *Cacospongia camera* by de Laubenfels, 1936, page 35, from the West Indian region. The first of these was digitate, the second ramose. Each of them was purple-red, with a reddish-gray interior, quite different from that of *tyrocis.* The first had exceedingly lumpy fibers, and the genus *Druinella* was first erected with a diagnosis based upon this lumpiness. Neither of the other species has it. *Camera* had almost no debris in the fibers, but *rotunda,* like *tyroeis,* had a great deal of foreign material. As de Laubenfels, 1948, page 97, points out, the genus is most sharply characterized by the exceedingly elongate, thin canals that lead to and from the flagellate chambers.

The specific name *tyroeis* is derived from a Greek word for "cheese," referring to the peculiar consistency of this species.

GENUS *THORECTOPSAMMA* Burton

Thorectopsamma mela, new

Text Figure No. 15
Plate VIII, Figure b

This species is here represented by the following:

U.S.N.M. No. 22932, My No. M. 302, here designated as type, collected on June 11, 1949, by hand while wading at Ailing-lap-lap Atoll at the south portion of the lagoon near Bikájela Islet. The depth was just below low tide, and the substrate was dead coral.

U.S.N.M. No. 22938, My No. M. 308, collected on June 20, 1949, by diver in the deep entrance channel east of Bikájela Islet at Ailing-lap-lap Atoll. The depth was 10 meters, and the substrate was dead coral.

U.S.N.M. No. 22944, My No. M. 315, collected on June 21, 1949, by diver in the north portion of the lagoon near Matien Islet at Ailing-lap-lap Atoll. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 22986, My No. M. 364, collected on July 5, 1949, by diver at Ebon Atoll in the south corner of the lagoon, in the miniature lagoon. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 22989, My No. M. 367, with the same collection data as the preceding specimen.

U.S.N.M. No. 23007, My No. M. 387, collected July 11, 1949, by diver at

Likiep Atoll near the east end of the lagoon, near Lado Islet. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 22806, My No. N. 012, collected June 5, 1946, by W. R. Taylor by dredging near the center of the lagoon of Eniwetok Atoll. The depth was 35 meters. This is the specimen which was nearly covered by *Lissodendoryx calypta.* (See page 133, and Plate 8, Figure b.)

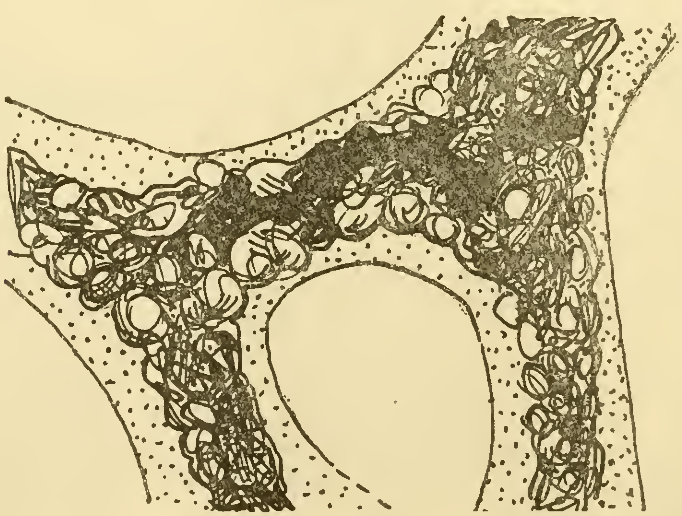
U.S.N.M. No. 23043, My No. M. 422, collected August 1, 1949, by diver, at eastern Ponapé (Matalanim) from a reef in the lagoon, near an entrance to the lagoon. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 23068, My No. M. 448, collected August 9, 1949, by diver in the central portion of the Truk lagoon near Scheiben Islet, northwest of Moen Islet. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 23108, My No. M. 490, collected September 1, 1949, by divers in Iwayama Bay, Koror, in the Palaus. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 23116, My No. M. 498, collected September 2, 1949, by diver, in Komebail Lagoon, northwest of Koror, in the Palaus. The depth was 5 meters, and the substrate was dead coral.

This species was abundant and widely distributed. It occurred in nearly all parts of the lagoon at Ailing-lap-lap and often was the only sponge in sight. It was not found at Majuro. It was abundant at Ebon, great bushes of it being observed at the large shoal in the center of the lagoon. It was fairly common at Likiep. In Ponapé, it occurred not only where collected



Text Figure No. 15. Portion of the fibrous skeleton of *Thorectopsamma mela,* X 182.

but was scattered around other sides of the island, too. In Truk, it was moderately common, and in the Palaus very common.

This species is usually ramose, but some of the Palau specimens were lamellate, or wall-shaped. Heights of at least 30 cm are reached, particularly in the Ebon specimens. The diameters of the branches are usually about 2 cm, but some are as narrow as only 1 cm. The lamellate specimens were thicker, up to 4 cm.

In general, the color was black but varied toward gray in the portions of specimens which were most shaded. An outstanding exception is the matter of all the specimens from Ebon. Throughout that atoll this species was consistently brown, rather than black; but in Ebon, as everywhere else, the endosome was the same drab shade. There was no distinctive odor to this sponge, such as characterizes *Ircinia* and some *Spongias*. The consistency was spongy, and it was easily cut.

The surface is conulose; and from each conule, numerous conspicuous lines radiate, so that the pattern is one of stars or stellate units. The conules are from 1 to 2 mm high and 2 to 4 mm apart. The common distance apart is 3 mm. The pores vary in diameter from 40 μ to 110 μ but are usually between 50 μ and 80 μ. They are distributed in groups within the meshes of the dermal skeleton, which is to be discussed below. The oscules in specimens actually vary from 1 to 11 mm in diameter, but in life they are rarely as much as 4 mm and seldom as little as 2 mm in diameter. They are scattered in all sorts of places, are not particularly terminal, are often as numerous as only 3 cm apart, but occasionally may be practically absent.

The ectosome of this species was carefully studied, because of the difficulty of locating it between *Thorecta* and *Thorectopsamma*. There is a very definite dermal reticulation of fibers, which are much like those of the endosome but in size are intermediate between those referred to as principal fibers and the others termed secondary fibers. That is to say, those of the dermis are about 100 μ in diameter and the outline meshes are about 300 μ to 600 μ in diameter. These meshes are filled in by a thin dermis scarcely 15 μ thick and perforated by the pores. In the majority of specimens, this dermis contains no foreign material; but, particularly in the specimens from Ponapé, Truk, and the Palaus, there are scattered bits of sand or other debris in it—not enough, however, to warrant calling it a sand-filled cortex.

The endosome is filled with a macroscopic fibro-reticulation. Among the meshes of this occur very dense protoplasmic structures which are crowded with small spherical flagellate chambers. These vary from 20 μ to 35 μ in diameter but the vast majority of them are between 25 μ and 30 μ in diameter.

The skeleton comprises fibers roughly separated into two sizes; the larger or principal ones are commonly about 200 μ in diameter but vary from 150 μ to 250 μ. These always contain much foreign material and, in some

cases, are so densely filled with coarse foreign material that their outlines are extremely lumpy. There are even more common secondary fibers present, usually about 80 μ in diameter but varying from 50 μ to upward of 100 μ. These show pale white or yellowish white spongin in concentric layers or laminae and almost always contain a linear core of debris. Here and there an occasional bit may be found to lack all foreign material, but one could scarcely say that the sponge was characterized by secondary fibers clear and free of foreign debris.

Until recently there existed in the literature only one species of the genus *Thorectopsamma,* and furthermore only one specimen of that. This was recorded by Burton, 1934, page 577, for a sponge dredged from a depth of 45 meters, near the northern portion of Australia and named *Thorectopsamma irregularis* but, unfortunately, not illustrated. In view of this great rarity of the genus in all other portions of the world, its extreme abundance throughout the Marshalls, the Carolines, and Palaus is noteworthy.

In 1950, page 20, de Laubenfels described a small peculiar "bleeding" species from Bermuda as *Thorectopsamma chromogenia.*

As compared to *mela, irregularis* was an irregularly massive, lipostomous sponge. Burton says that it has no dermal skeleton. He gives no data regarding its flagellate chambers.

It was originally intended to name this species *melanodactyla,* from the Greek words for "black" and "fingers." The genus name, however, is so very long that it seems inappropriate to have also an extremely lengthy species name. Therefore, the abbreviation *mela* is selected.

Thorectopsamma xana, new

Text Figure No. 16

This species is here represented by the following:

U.S.N.M. No. 23000, My No. M. 379, here designated as type, collected July 11, 1949, by diver at Likiep Atoll in the southeast corner of the lagoon near the church. The depth was 3 meters, and the substrate was dead coral.

U.S.N.M. No. 22948, My No. M. 321, collected June 24, 1949, by diver at Ailing-lap-lap Atoll in the east end of the lagoon near Jih Islet. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 22828, My No. M. 103, collected June 11, 1949, by hand while wading at Ailing-lap-lap Atoll in the south side of the lagoon, Bikájela Islet. The depth was at low tide, and the substrate was dead coral.

U.S.N.M. No. 22954, My No. M. 328, collected June 28, 1949, by diver at Majuro Atoll at the east end of the lagoon near Rita or Jarej Islet. The depth was 4 meters, and the substrate was dead coral.

U.S.N.M. No. 22994, My No. M. 372, collected July 7, 1949, by diver at Ebon Atoll, west corner of the lagoon north of the Pearl Pool. The depth was 3 meters, and the substrate was dead coral.

U.S.N.M. No. 22996, My No. M. 374, collected July 7, 1949, by diver at Ebon Atoll, from the open ocean just west of Rubé point. The depth was 3 meters, and the substrate dead coral.

U.S.N.M. No. 22864, My No. M. 158, collected July 11, 1949, by diver, at Likiep Atoll, southeast corner of the lagoon, near the church. The depth was 3 meters, substrate dead coral.

U.S.N.M. No. 23089, My No. M. 471, collected August 13, 1949, by diver, at Truk, in the west portion of the lagoon, in Lemotol Bay. The depth was 4 meters, substrate dead coral.

U.S.N.M. No. 23128, My No. M. 511, collected September 6, 1949, by using a fish spear, in Iwayama Bay near Ulebsechel Island, Palau Archipelago. The depth was 1.5 meters, and substrate was dead coral.

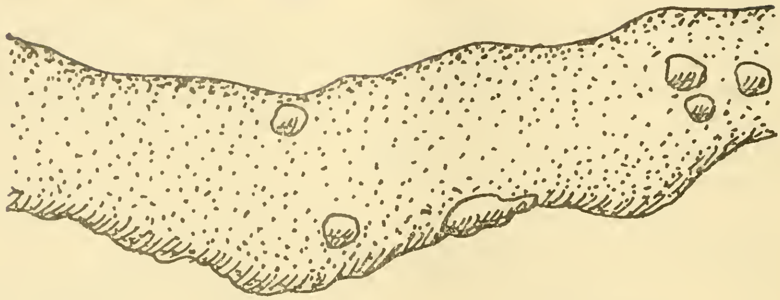
The species also was collected at Bikini Atoll in 1948 by T. E. Bullock (his numbers C. 335 and C. 102).

This species was collected also at Eniwetok Atoll in 1948 by T. E. Bullock (his number Z 105).

This species was moderately common at Ailing-lap-lap and was widely distributed. It was similarly common and widespread at Majuro Atoll and Ebon Atoll. It was conspicuously abundant at Likiep Atoll in all regions studied (which comprised the east end of the lagoon). It is probably one of the three or four commonest sponges in the Marshall Islands. I could not find it at Ponapé but suspect it is there. I did find it very rarely at Truk and in the Palaus.

This species was found largely in very shallow water, from bottoms almost exposed at low tide, to a depth of at least 5 meters. The substratum regularly was dead coral. Young specimens begin as a crust, but the species should definitely be classified as not one of the incrusting type. The crust tends to become thicker and thicker as it becomes older, which is not true of definitely incrusting species, and it soon begins to send up ramose projections which may become quite high. Some projections were found to be at least 50 cm in vertical measurement. These ramose branches usually ranged between 1 and 2.5 cm in diameter.

The color in life was regularly yellow, in a few cases almost orange-yellow; but upon dying in the air or in alcohol it changed first to purple and finally to black. A conspicuous difference in the time required was noticed from east to west. The many Marshall Island specimens required several hours, say as many as four, for complete change to take place. This change was irregular, some spots becoming black almost at once whereas others remained yellow after four hours. In contrast, the specimens from Truk and the Palaus changed in five minutes to the full black color.



Text Figure No. 16. Portion of the fiber of *Thorectopsamma xana,* X 182.

The consistency was spongy.

The surface is conulose, with conules ranging from 0.5 to 2 mm but usually about 1 mm high. They vary from 2 to 6 mm apart but almost always are about 3 mm apart. The pores are 50 μ to 150 μ in diameter and are scattered. They often occur about one per each square mm. This species is often lipostomous, and the exhalant openings cannot be distinguished from the inhalant ones. The only exception was the single specimen from the Truk Archipelago. In it, there were some definite exhalant apertures, 2 mm in diameter, that could be discerned.

The ectosome is a fleshy dermis, 15 μ to 20 μ thick, and very tightly attached to the underlying tissues. In a few places, a subdermal canal may be found, and in these places the membrane may be detached. Elsewhere, it is amalgamated to the fibro-reticulation of the endosome. The latter is definitely like that of *Verongia* in general appearance, exceedingly dense and fine-grained. The flagellate chambers vary actually from 25 μ to 40 μ in diameter but are usually about 30 μ in diameter.

The skeleton is a reticulation of fibers which are laminated with yellow spongin and almost invariably cored with foreign material. They are not sharply separated into primaries and secondaries. They vary from 150 μ to 270 μ in diameter and have many intermediates. The fact that they are here and there clear of foreign material hardly constitutes a separate category of secondaries devoid of foreign inclusion. Yet their relative abundance raises the question of need for further investigation and deliberation.

The species *xana* is not a typical *Thorectopsamma.* It bears some resemblance to the genus *Cacospongia,* which is characterized by having primary fibers of the type found in *xana,* but secondary fibers of a distinct category which is regularly devoid of debris. Its type is *Cacospongia mollior,* and its author (Schmidt, 1862, page 27) said that its color was yellowish white and that it became darker in the air or in alcohol. The lack of emphasis placed upon this description makes it seem unlikely that the change was as striking

as that in *xana.* In this regard, the latter species appears exceedingly like the *Verongias* of the West Indies and Mediterranean, which have attracted so much attention for their color change. The appearance of *xana* and its effect upon the sense of touch are extremely like that of *Verongia;* but this latter genus is characterized by skeletal fibers, always having a conspicuous central pith and never containing debris. It is noteworthy that in the specimen from Truk (number M. 471) that some of the clear fibers showed definitely such a pith, but these were very exceptional. It may appropriately be said that *Thorectopsamma xana* takes the place throughout the western Pacific that is filled in many other parts of the world by species of the genus *Verongia.*

It was originally intended to name this species *xanthocyana,* in view of its color change, this name being derived from Greek words which are supposed to mean respectively "yellow" and "blue." Because the genus name is so long, it seems inappropriate also to have a lengthy species name, hence *xana* is selected as an abbreviation.

FAMILY DYSIDEIDAE Gray

GENUS *DYSIDEA* Johnston

Dysidea fragilis (Montagu) Johnston

Text Figure No. 17

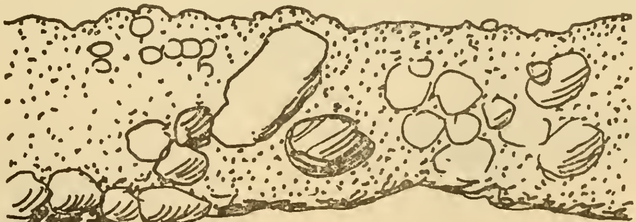
This species is here represented by the following:

U.S.N.M. No. 22931, My No. M. 301, collected June 11, 1949, by hand while wading in the lagoon of Ailing-lap-lap Atoll near Bikájela Island. The depth was low tide, and the substrate was dead coral.

This specimen is incrusting, with lobes, most of them about 7 mm thick. The total amount represents two patches about the size of the palm of one's hand.

The color in life was dull gray, both on ectosome and endosome. The consistency was spongy: tough while wet, fragile when dry.

The surface is conulose, with conules about 0.3 mm high and about one conule per each square mm. The surface is rather slimy to the touch. The pores are microscopic and closed, and the same may be said of the oscules.



Text Figure No. 17. Portion of the fiber of a sponge identified as *Dysidea fragilis,* X 182.

The ectosome is a thin, fleshy dermis. The endosome is very full of foreign material in the fibers and loose among the protoplasmic structures. The flagellate chambers are large, sack-shaped, and coarse.

The skeleton consists of an open reticulation of fibers about 150 μ in diameter loaded with foreign debris.

This species was first described as *Spongia fragilis* by Montagu, 1818, page 114, and put as type of the genus *Dysidea* by Johnston, 1842, page 187. A very extensive treatment of its distribution and synonymy will be found in Burton, 1934, page 582. This is one of the very most widely distributed of all sponge species. Unlike other members of the order Keratosa, its distribution takes it far into the Arctic and almost into the Antarctic, as well as completely around the equator. It is not astonishing, therefore, to find it in the Marshall Islands, but it is remarkable that the species is so uncommon in this portion of the tropical Pacific.

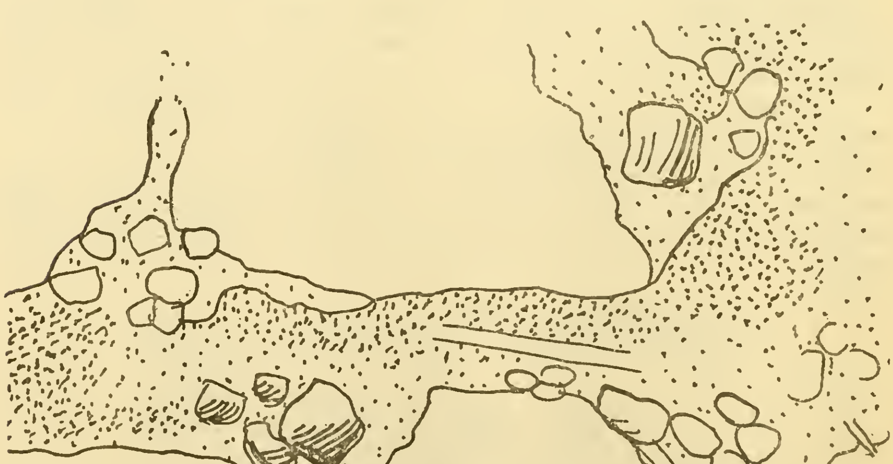
Dysidea avara (Schmidt) de Laubenfels

Text Figure No. 18

This species is here represented by the following:

U.S.N.M. No. 22945, My No. M. 316, collected June 21, 1949, at Ailinglap-lap Atoll, by diver, at the north side of the lagoon near Matien Islet. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 23032, My No. M. 411, collected July 30, 1949, by diver in northwestern Ponapé in the lagoon at a depth of 5 meters. The substrate was dead coral.



Text Figure No. 18. Portion of the fiber of a sponge identified as *Dysidea avara*, X 182.

This is a massive sponge, about 4 cm in diameter in the one case and 10 to 16 cm in diameter in the other.

The color was violet, the specimen from Ailing-lap-lap being described in the field as "vivid violet." That from Ponapé was more dull. The interior was the same color as the exterior. The consistency was very spongy.

The surface of this species is distinctive. It is coarsely conulose instead of finely conulose like *fragilis*. The conules are about 2 to 3 mm high and 6 to 10 mm apart. The pores are easily observed. They are about 80 μ to 200 μ in diameter and 160 μ to 380 μ apart, center to center. The oscules, about 10 mm in diameter, are often on the summits of lobes and look somewhat like the mouths of craters.

The ectosome and endosome do not significantly differ from *fragilis*. There is a thin skin of a protoplasmic nature, and the interior contains much debris, especially in the fibers. The flagellate chambers are about 100 μ in diameter and are sack-shaped or eurypyllous.

The skeleton consists of a coarse reticulation of fibers which vary greatly in diameter throughout their length, being exceedingly lumpy and irregular. They are crowded with foreign material, sand grains, and fragments of foreign spicules. An average diameter is about 150 μ.

This species was first described as *Spongelia avara* by Schmidt 1862, page 29, from the Mediterranean. I found only the two specimens in the summer of 1949, which was strange inasmuch as this species appears to be common in the Philippines (de Laubenfels, 1935, page 328) and occurs in Hawaii (de Laubenfels, 1950, page 9). Lendenfeld records it from the Australian region (1889, page 667). It is doubtless circumequatorial in distribution.

Dysidea chlorea new

Text Figure No. 19

This species is here represented by the following:

U.S.N.M. No. 22971, My No. M. 347, here designated as type, collected July 5, 1949, by hand while wading in the western portion of the lagoon at Pearl Pool at Ebon Atoll. The depth was just below tide mark, and the substrate was dead coral. This species was common in this one locality.

This is a ramose sponge with simple fingers 3 to 4 mm in diameter rising to a height of about 4 cm from a very small basal mass.

Text Figure No. 19. Portion of the fiber of *Dysidea chlorea*, X 182.

The color, both of endosome and ectosome, was a pale, yellowish green, and the consistency was softly spongy.

The surface is conulose, with conules 0.3 mm high and about 1 mm apart. The pores and oscules are both microscopic and readily closed, so that this has the condition known as lipostomous.

The general structure is much like that of *Dysidea fragilis,* with a thin fleshy dermis and an endosome characterized by eurypyllous or sack-shaped flagellate chambers, about 50 μ to 60 μ in diameter.

The skeleton of this species consists of a reticulation of debris-filled fibers, which are rather fine as compared to those of other members of the genus, about 80 μ in diameter.

This species is undoubtedly close to *fragilis* and, according to some philosophies of taxonomy, might be regarded as a synonym of *fragilis.* It is, however, consistently finer-grained than most specimens of the earlier species and is sharply set off by the very distinctive color. This latter characteristic, in this relatively common species in Ebon Atoll, was quite consistent.

The name is based upon the Greek word which is thought to mean "green."

Dysidea herbacea (Keller) Burton

Text Figure No. 20

This species is here represented by the following:

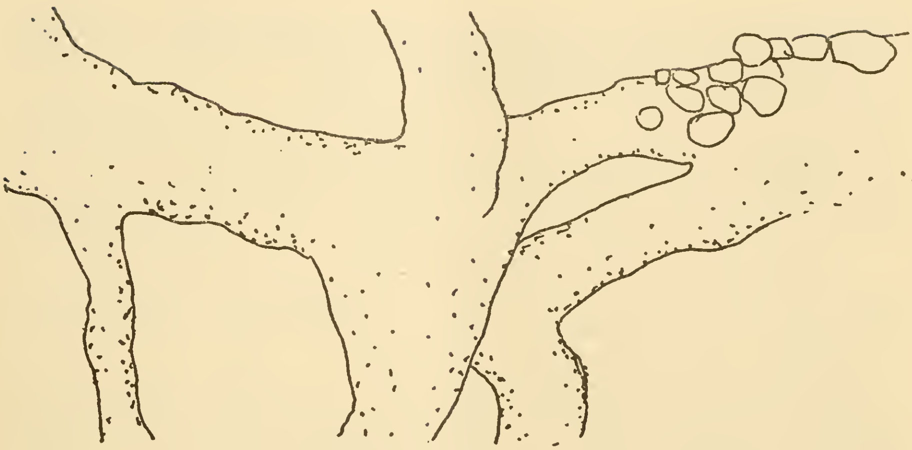
U.S.N.M. No. 22947, My No. M. 319, collected June 21, 1949, by diver at the north side of the lagoon, near Matien Islet, of Ailing-lap-lap Atoll. The depth was 5 meters, and substrate was coral that may have been alive.

U.S.N.M. No. 23095, My No. M. 477, collected August 17, 1949, by diver at Kuop Atoll in the northeast corner of the lagoon near Givry Islet. The depth was 2 meters; substrate was dead coral.

This is a ramose species, 5 to 10 mm in diameter and upwards of 20 cm high, especially in the case of specimens from Kuop Atoll.

The first specimen mentioned had a dirty lavender gray exterior and a very pale, drab interior. The ones from Kuop were gray with light purple patches and had a drab interior so pale as to be almost white. The consistency was ropelike, tough and flexible rather than elastic.

The surface is to be described as rugose or granulose rather than conulose. There are about 3 minute lumps for each 2 square mm. The pores are about 80 μ to 150 μ in diameter and 150 μ to 350 μ apart, center to center. The oscules are about 1 mm in diameter and are widely scattered, often as much as 2 or 3 cm apart. Large areas of the sponge may be devoid of them completely.



Text Figure No. 20. Portion of the fibrous skeleton of *Dysidea herbacea,* X 182.

The ectosome is quite coarse, about 400 μ thick. It contains some foreign material. It is much thicker in some places than in others and is underlain by fairly extensive subdermal canals. The endosome is typical of the genus *Dysidea,* with flagellate chambers that are sack-shaped or eurypyllous, about 35 μ to 50 μ in measurement.

The skeleton consists of fibers not sharply divided into primaries and secondaries, although some are as thin as 40 μ in diameter and others as thick as 140 μ. All are loaded with foreign debris and make a reticulation of which the meshes are often triangular.

This species was first described as *Spongelia herbacea* by Keller, 1889, page 336, from the Red Sea. Burton in 1934, page 593, regards it as a good species of *Dysidea* and extends its distribution throughout the Indian Ocean, East Indies, and the north and south coasts of Australia, in part by referring a number of other species to it in synonymy. One specimen of *herbacea,* as noted above, was collected near Matien Islet, which was a locality from which *Dysidea avara* was also collected. The two species were in great contrast to each other. In the field, they appeared to be so different that one might expect them to belong in different genera, rather than the same genus.

Dysidea rhax, new

Text Figure No. 21

This species is here represented by the following:

U.S.N.M. No. 23013, My No. M. 393, here designated as type, collected July 11, 1949, by diver at Likiep Atoll at the east end of the lagoon near Lado Islet. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 23016, My No. M. 396, collected July 13, 1949, by diver at Likiep Atoll at the south side of the lagoon near Eotli Islet. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 22957, My No. M. 331, collected June 28, 1949, by diver at Majuro Atoll at the east end of the lagoon near Rita (or Jarej) Islet. The depth was 4 meters, and the substrate was dead coral.

U.S.N.M. No. 22992, My No. M. 370, collected July 7, 1949, by diver at Ebon Atoll at the southeast side of the lagoon. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 23027, My No. M. 406, collected July 30, 1949, by diver in northwestern Ponapé in the central part of the lagoon. The depth was 5 meters, and the substrate was dead coral.

This species was abundant at Likiep, common at Majuro, uncommon and atypical at Ebon and apparently absent from Ailing-lap-lap. In the Carolines, I found only the one specimen and that at Ponapé.

This species is consistently a mass with irregular projections. The Ebon specimen was merely incrusting but may have been juvenile or not in healthy condition.

The color was distinctive. The exterior was regularly purple. The above-mentioned incrusting specimen was also purple on the interior, but this was due to its small size. All the other specimens showed a strikingly different interior color. In the Majuro specimen, the interior was merely drab; in the very abundant specimens throughout Likiep, some were yellow, some were green, and a very few were intermediate. The one specimen from Ponapé was intermediate, that is to say, yellow-green. The consistency was spongy but not like that of other specimens of the genus *Dysidea*. Instead it was rather like specimens of the genus *Verongia*. It had a somewhat cheese-like consistency, easily sliced, due to the comparatively dense protoplasmic structures and the rather thin, widely separated fibers.

The surface is conulose, of a very distinctive type. The projections do not come to a peak, as is typical of conules. In fact, another word perhaps

Text Figure No. 21. Portion of the fiber of *Dysidea rhax*, X 182.

should be found to describe these surface structures. Each is about 2 mm high and 3 to 4 mm apart, but the apex of each is flattened and in turn is covered with minute projections. The specimen from Ebon is placed in this species largely because it has this surface covered with peculiar truncated cones. The pores are extremely small, only 15 μ to 35 μ in diameter. They are irregularly distributed; in places they are only 30 μ to 40 μ apart, and other regions several square mm in area are devoid of them entirely. Only the larger specimens show any oscules at all, and these are very small, say 3 to 4 mm in diameter, and readily closable.

The ectosome is covered with a dermis that perhaps is made of spongin and is about 20 μ thick. The endosome has comparatively dense protoplasmic structure and relatively few fibers. In many specimens, particularly the type, there are numerous bits of foreign material, such as broken shell fragments. These shells give every indication of being in a process of solution, being much eroded and softened. Where this species rested on coral, the latter was also altered to a sort of white mush or porridge. The flagellate chambers are sack-shaped or eurypyllous, varying from 35 μ by 75 μ to 40 μ by 60 μ. In fact, a few as long as 80 μ were found.

The skeleton of this species is not characteristic of the genus *Dysidea*. There are fibers which at the base of the sponge start out rather large, even as much as 400 μ in diameter. These may be the oldest portion of the fiber. They have the dendritic shape—that is to say, they branch often. Yet, the sponge is not entirely dendritic, because anastomoses do occur, making meshes which in some cases are rather small but which are more often quite coarse. After many branchings, near the surface of the sponge, the fibers are only 65 μ in diameter.

The peculiar micro-conulose, truncated tops of the pseudo-conules doubtless result from the tendency of these fibers to branch repeatedly, especially near the surface of the sponge. In places there are regions, several cubic mm in area, which are completely devoid of fibers so that there is a suggestion of resemblance to the genus *Pleraplysilla*. The new species *rhax* is set apart rather sharply from others of the genus *Dysidea* by its peculiar surface, its rather odd semi-dendritic skeleton, and by its distinctive combination of purple ectosome and yellow or yellow-green interior.

The species' name is selected from the Greek word for "grape" because many specimens of this fruit have the greenish interior with a purple skin.

Dysidea crawshayi de Laubenfels

Text Figure No. 22

This species is here represented by the following:

U.S.N.M. No. 22955, My No. M. 329, collected June 28, 1949, by diver at Majuro Atoll in the northeastern part of the lagoon. The depth was 3 meters, and the substrate was dead coral.

U.S.N.M. No. 22856, My No. M. 150, collected July 7, 1949, by diver at Ebon Atoll in the southeastern part of the lagoon. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 23005, My No. M. 385, collected July 11, 1949, by diver at Likiep Atoll in the eastern part of the lagoon near Lado Islet. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 22877, My No. M. 174, collected July 30, 1949, by diver in northwestern Ponapé near the shore or landward side of the lagoon. The depth was 2 meters, and the substrate was dead coral.

Only one sample of this species was found at both Majuro and Ebon, but it was common at Likiep and Ponapé where it occurred especially in the southwestern portion, called Kiti.

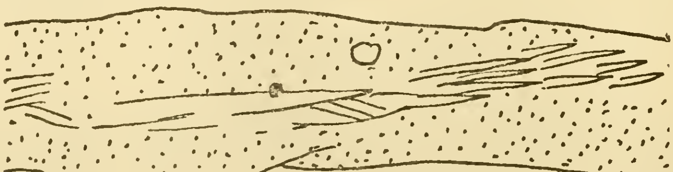
This is an amorphous, or massive, sponge. The youngest specimens are incrusting. The maximum thickness of some specimens seems to be about 5 cm, and the lateral growth may be indefinite over the three-dimensional masses of jagged coral.

The color in life was vivid orange, sometimes almost red-orange, of both the endosome and ectosome. The consistency was soft, slimy, and weak, so that the sponge falls apart of its own weight when lifted out of water.

The surface of this species is coarsely conulose, the conules being about 3 mm high and often 9 mm or more apart. The pores are about 0.3 mm in diameter, and there is about one for each square mm. Many of the specimens have no evident oscule.

The ectosome is covered with a very thin fleshy dermis, about 15 μ thick. The endosome is also very fleshy.

The skeleton of this species definitely needs further study. There is some information in de Laubenfels, 1950 (Bermuda), but this is only a beginning. There is a vague reticulation of what may be called fibers. These are not at all the cylindrical objects often thus designated, but have an exceedingly irregular cross-section. They are in some cases like strips or sheets—torn, jagged, and stuck together here and there. They are regularly packed with foreign objects, which at first seem to be sponge spicules. A few of them are clear-cut spicules, may be studied in boiled-out preparations, and are undoubtedly derived from neighboring specimens of Porifera.



Text Figure No. 22. Portion of the fiber of *Dysidea crawshayi,* X 182.

The vast majority of these objects dissolve in boiling nitric acid, yet with little or no carbon dioxide gas formed. They are, therefore, almost certainly neither silica nor calcium carbonate. It is possible that they are chemically the fluoride of some one of the less common metals. It is furthermore possible (although far from certain) that they are actually produced by the sponge in which they are found. Their diameter is usually 4 μ, rarely as little as 3 μ or as great as 5 μ. They seem always to be broken and pieces as long as 500 μ are uncommon. No sharp pointed termination, or other indication of unbroken ends, could be found.

This species was described first by de Laubenfels, 1936, page 28, from the West Indies (Dry Tortugas). It is very abundant in the Bermudas, but this is the first record from the Pacific area.

GENUS *EURYSPONGIA* Row

Euryspongia phlogera, new

Text Figure No. 23

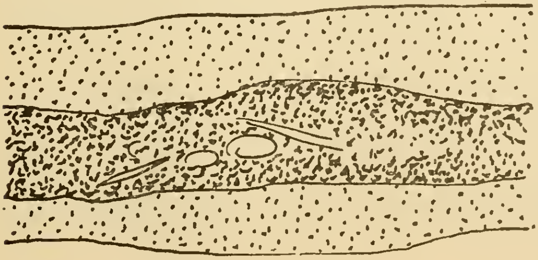
This species is here represented by the following:

U.S.N.M. No. 22952, My No. M. 326, here designated as type, collected on June 24, 1949, by diver at Ailing-lap-lap Atoll at the east end of the lagoon, near Jih Islet. The depth was 12 meters, and the substrate was dead coral.

This is a massive or club-shaped specimen, 15 cm high and 6 cm in diameter.

The exterior and interior color in life was a vivid reddish orange. The consistency was softly spongy.

The surface is conulose, with conules about 2 or 3 mm high and 8 to 10 mm apart. Each shows a protruding fiber, and many of these fibers are somewhat branched at the distal termination. The pores are about 300 μ in diameter and are abundant, about one for each square mm. Each of these skeletal pores, however, is in turn filled in with a protoplasmic membrane, which is perforated by holes about 45 μ to 75 μ in diameter, the partitions between which are only about 5 μ wide. This strongly suggests the genus



Text Figure No. 23. Portion of the fiber of *Euryspongia phlogera,* X 182. The conspicuous core of foreign material is illustrated.

Dendrilla. No separate oscules could be made out, however, and probably some of the small openings are inhalant as well as exhalant.

The ectosome is a thin fleshy dermis, and the endosome is also quite fleshy. The flagellate chambers are sack-shaped or eurypyllous but rather small, only about 40 μ in diameter.

The skeleton is chiefly dendritic, but there are definitely a few connections between fibers, making somewhat of a network; in fact, some meshes are only 300 μ in diameter. The fibers are larger near the base of the sponge, and become smaller as they branch often and reach nearer the surface. They decrease from about 180 μ down to 50 μ or smaller. They are made of pale yellow-gray translucent spongin, and in many places, particularly in the larger fibers, they are cored with foreign material. This foreign material often represents only about the central third of the fiber.

This species is sharply characterized by its distinctive color. The species *rosea* from the West Indies is rose-red; the common Australian species *semicanalis* and *arenifibrosa* are dull brown; and the type species (*lactea*) from the Red Sea is milky white. The other species also have distinctive characteristics which separate them from *phlogera.* For example, *semicanalis* has erect, hollow cylinders leading to its oscules, and *repens* from Chile has a peculiar warty structure.

The name selected is derived from a Greek word meaning "flaming."

GENUS *DENDRILLA* Lendenfeld

Dendrilla nigra (Dendy) de Laubenfels

Text Figure No. 24

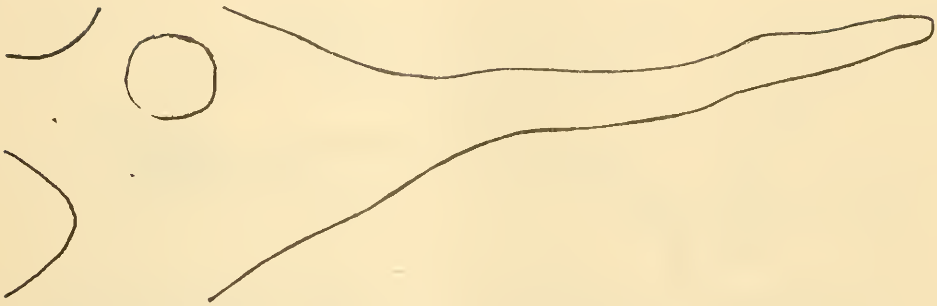
This species is represented by the following:

U.S.N.M. No. 22873, My No. M. 169, collected on July 13, 1949, by diver at Likiep Atoll in the south side of the lagoon near Eotli Islet. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 23111, My No. M. 493, collected on September 1, 1949, by divers in Iwayama Bay, Koror, in the Palaus. The depth was 2 meters and the substrate was dead coral.

The Likiep specimen was incrusting, probably because it was a young specimen or one not thriving. The specimen from Iwayama Bay was more lamellate and irregular in shape. The color of the sponge, both inside and out, was inky blue-black. The consistency was softly spongy, easily torn.

The surface is covered by irregular conules, about 1 mm high and 2 to 5 mm apart, but considerable areas of the surface may be smooth. On the other hand, they are not shiny or glistening smooth. The pores are about 40 μ in diameter and very abundant, in places only 60 μ apart, center to center. The oscules vary greatly with the size of the sponge, being indistinguishable in the young specimens mentioned above, but up to 6 mm in



Text Figure No. 24. Portion of one of the smaller bits of fiber in *Dendrilla nigra,* X 182.

diameter in the larger ones from the Palaus. They are not circular in cross section but have what may be termed scalloped edges.

The ectosome is an obvious dermis, stretching over extensive subdermal cavities. The endosome is moderately dense and obviously permeated by fibers. The flagellate chambers are about 40 μ to 60 μ and are sack-shaped or eurypyllous.

The skeleton consists of fibers which are made of stratified, yellow spongin. These are semi-dendritic; they are larger near the base of the sponge, where they reach a diameter of about 150 μ. As they branch more and more, they become smaller until at the surface they are only about 40 μ in diameter. They frequently anastomose, however, so that this is not a true dendritic skeleton, but one of which much is reticulate. In fact, some of the meshes are round and only 60 μ in diameter. Others are triangular in shape.

This species was first described as *Spongionella nigra* by Dendy, 1889, page 94, from the vicinity of Ceylon. These occurrences in the Pacific Islands appear to be the next record in print for this species.

Dendrilla verongiformis, new

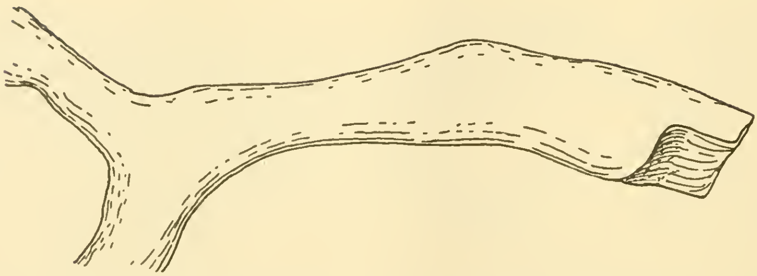
Text Figure No. 25

This species is here represented by the following:

U.S.N.M. No. 23104, My No. M. 486, here designated as type, collected September 1, 1949, by divers in Iwayama Bay, Koror, in the Palaus. The depth was 2 meters, and the substrate was dead coral.

This species was moderately common in Iwayama Bay, but I did not find it common elsewhere.

This is a lamellate or ramose sponge, often as high as 20 cm, colonies also reach a diameter of 20 cm.



Text Figure No. 25. Small portion of fiber from *Dendrilla verongiformis,* X 182.

The color in life, both as to ectosome and endosome, was yellow, tinged with green. Upon dying in air or in alcohol, the sponge slowly turns to blue-green and finally to blue-black. Several hours were usually required for the complete alteration. The consistency was remarkably like that of many sponges of the genus *Verongia:* dense and fleshy, almost like the feeling of meat to the touch. Even when fresh and not hardened in a fixative, such a sponge can be sliced rather thin with a razor.

The surface of this species is covered with conules 2 mm high and 2 to 10 mm apart, the larger distances being much more common. The pores and oscules are both microscopic and so readily closed that the maximum diameter cannot be stated.

The ectosome is a distinct dermis, 50 μ to 65 μ thick, tough, and easily separated from the underlying endosome. The latter is rather dense yet full of large flagellate chambers, 50 μ by 90 μ to 70 μ by 110 μ in size, and sack-shaped or eurypyllous. The fibers are relatively inconspicuous in the midst of this flesh.

The skeleton of this species consists of semi-dendritic fibers of very small size. Their maximum size is only about 100 μ in diameter, and they usually are 40 μ or less. Typical of the genus *Dendrilla,* they arise large at the base; and, as they branch repeatedly, they become somewhat smaller. Yet they are not truly dendritic, because of the fairly numerous anastomoses between them. These fibers are yellow and very distinctly stratified. Here and there in them are small scattered bits of debris, but so infrequent that they cannot properly be called cored fibers.

This species is characterized to some extent by the peculiar fibers, even more by the pronouncedly fleshy consistency, and most of all by the distinctive color and color change. This metachromic effect has been discussed in connection with several species already described.

The species name refers to the great resemblance of the flesh of this species to that of the genus *Verongia.*

FAMILY APLYSILLIDAE Vosmaer
GENUS *APLYSILLA* Schulze
Aplysilla sulfurea Schulze

Text Figure No. 26

This species is here represented by the following:

U.S.N.M. No. 22837, My No. M. 121, collected June 28, 1949, by diver at Majuro Atoll, near the north side of the lagoon and Enemanok Islet. The depth was 2 meters, and the substrate was the under side of an upside-down discarded enamelled dinner plate.

U.S.N.M. No. 22841, My No. M. 129, collected July 2, 1949, by diver at Majuro Atoll in the southeast corner of the lagoon near Te-elop Islet. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 22878, My No. M. 175, collected July 30, 1949, by diver in the lagoon of northwestern Ponapé, near the shore or landward side. The depth was 2 meters, and substrate was dead coral.

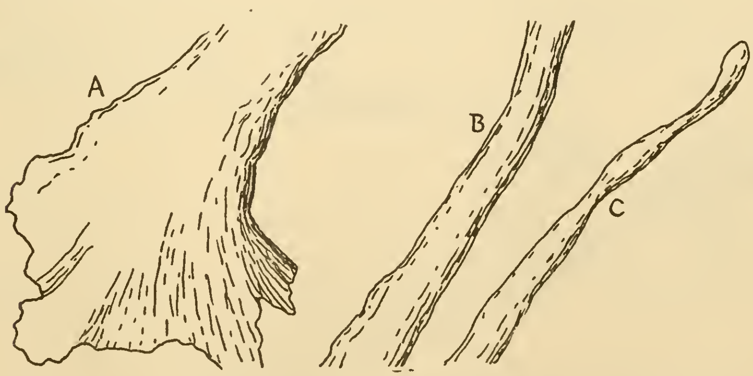
This species was rather common at Ponapé and found only twice at Majuro. It was not found elsewhere in 1949.

This is an incrusting species, and the specimens here discussed were all less than 1 mm thick and about 4 or 5 cm in diameter.

The exterior and interior color in life was lemon yellow and changed to purple and dead black when dying in air or in alcohol. The consistency was soft, slimy, and colloidal.

The surface is conulose, the conules about 1 mm high but made to seem higher because generally a fiber (or branching fiber) protrudes. These conules are about 1.5 to 3 mm apart. The pores and oscules are microscopic and readily closed.

The ectosome is a thin dermis, and the endosome is fleshy, with sack-shaped flagellate chambers.



Text Figure No. 26. Bits of fiber from *Aplysilla sulfurea,* X 182. *A:* Base of a fiber. *B:* Central portion of the same. *C:* Apical termination of the same.

The skeleton consists of translucent, pale yellow fibers with concentric layers of spongin, and no cores. They are completely dendritic, branching often, but seldom or never anastomosing. They arise from a basal plate of spongin and, at first are about 150 μ in diameter; but, as they approach the surface, they become smaller and smaller, due to the branching—finally becoming about 25 μ in diameter.

These specimens here discussed do not differ in any noticeable respect from those of *Aplysilla sulfurea,* except that each of them is so small and undeveloped. One wonders whether they might possibly display differences from *sulfurea* if they were to grow in more luxuriant form.

Aplysilla sulfurea was first described by Schulze 1878, page 405, from the Mediterranean. It has been reported from the Atlantic Coast of North America by de Laubenfels, 1947, page 35, and from Australia by Lendenfeld, 1889, page 707.

Aplysilla polyraphis de Laubenfels

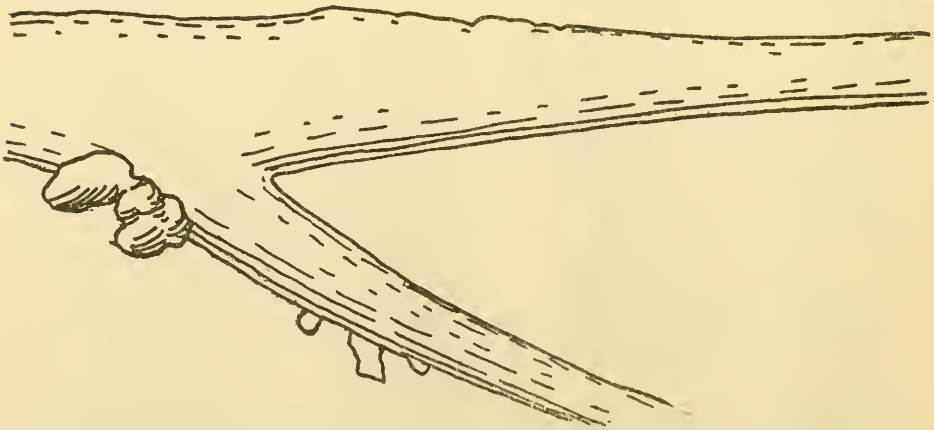
Text Figure No. 27

This species is here represented by the following:

U.S.N.M. No. 22883, My No. M. 182, collected August 1, 1949, by diver in eastern Ponapé (Matalanim) from a reef in the lagoon near an entrance into the lagoon. The depth was 5 meters, and the substrate was dead coral.

This species is incrusting and, as found, had several patches, each less than 1 mm thick and covering about 100 square cm.

The endosome and ectosome color in life was purple; and, upon handling, it exuded large quantities of crimson or royal purple colloid. The consistency was dual: the conules were definitely spongy, but the ground stuff between them was fleshy.



Text Figure No. 27. Portion of the fiber of *Aplysilla polyraphis,* X 182.

This sponge is conulose with conules 3 mm high and 5 mm apart, each conule representing the upward termination of a skeletal element. There are skeletal pores which are about 280 μ in diameter, filled in with a very thin membrane, which is perforated by smaller pores. The latter are only some 10 μ to 30 μ in diameter. Typically, there are about 25 such within each large pore. No difference can be made between exhalant and inhalant openings.

The ectosome and endosome are loaded with foreign debris. Much of this foreign material consists of broken spicules of various sorts from other sponges occurring in the vicinity.

The skeleton consists of widely separated dendritic fibers about 90 μ in diameter. These branch only a few times before they reach the surface of the sponge and there account for the conules.

This species was described as *Aplysilla polyraphis* by de Laubenfels, 1930, page 29, and in 1932, page 126, from the coast of California. The agreement between the previous specimens and this from Ponapé is astonishingly great. It seems quite strange to think of the same species occurring in the western Pacific and in the cold waters off California. On the other hand, various species of *Aplysilla,* especially *A. glacialis,* are known to be practically cosmopolitan in distribution. It may be that this species is equally widespread but more rare, and therefore seldom discovered.

FAMILY HALISARCIDAE Vosmaer

GENUS *HALISARCA* Dujardin

Halisarca metabola, new

Text Figure No. 28

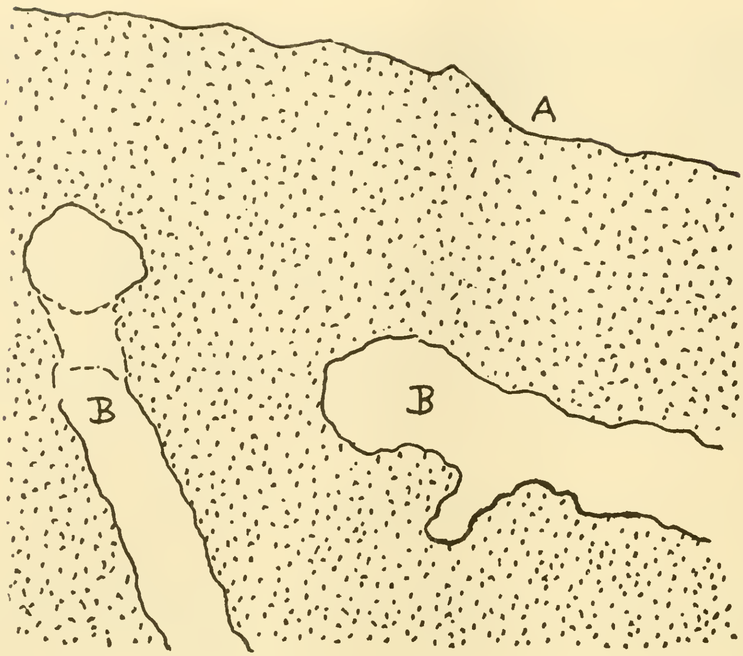
This species is here represented by the following:

U.S.N.M. No 22962, My No. M. 336, here designated as type, collected June 29, 1949, by diver at the west end of the lagoon, Majuro Atoll, in the miniature lagoon near Laura Islet. The depth was 2 meters, and the substrate was dead coral. Several other specimens of the same sort were observed in this limited vicinity.

This is an incrusting sponge, occasionally reaching a thickness of 2 mm and aggregating about 20 square cm in total area.

The endosome and ectosome color in life was a beautiful yellowish green. Upon dying either in the air or alcohol, it turned quickly to an opaque blackish green and finally to very black. The consistency in life was a colloidal sol, about like that of raw egg-white. In alcohol the sponge shrinks in size and has become much tougher.

The surface of this species is glistening shiny smooth. The pores and oscules are indistinguishable, microscopic, and quickly closed.



Text Figure No. 28. Portion of a section of *Halisarca metabola,* X 146. *A:* Surface. *B:* Canals.

There is no distinctive dermis or cortex; and, under the microscope, the endosome shows as a crumbling mass of fragments in which the flagellate chambers readily may be made out. They are eurypyllous and are up to 60 μ by 80 μ in measurement. The tissues of this sponge contain some protoplasmic structures of a peculiar appearance, as though some of the ground mass was full of parallel strands, each about 0.5 μ in diameter. This fiberlike tissue may be a nonliving mesogloea or skeletal ground substance; no mineral nor horny skeleton whatsoever is present. This lack characterizes the genus *Halisarca.* This species is somewhat distinctive for the abovementioned ground substance but most strikingly for the change in color from yellow to black.

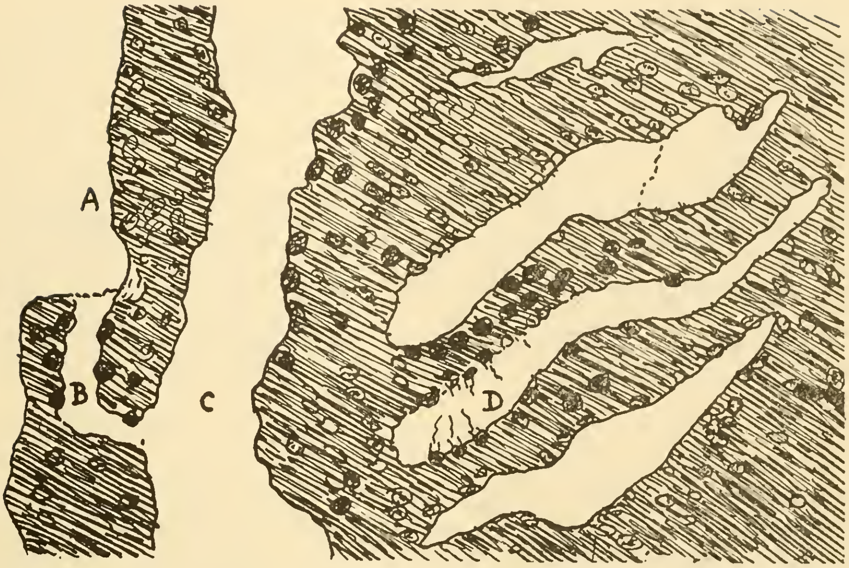
The species name selected is taken from the Greek word indicating a pronounced change.

Halisarca melana, new

Text Figure No. 29

This species is here represented by the following:

U.S.N.M. No. 22915, My No. M. 220, here designated as type, collected September 1, 1949, by divers in Iwayama Bay, Koror, in the Palaus. The depth was 2 meters, and the substrate was dead coral.



Text Figure No. 29. Portion of a section of *Halisarca melana*, X. 682. *A:* Surface. *B:* Pore. *C:* Subdermal space. *D:* Flagellate chamber; several choanocytes show near the letter. All or part of three additional flagellate chambers are also shown. Many of the amoebocytes, which contain black spherules, and which are responsible for the black color of the species, may be seen throughout the tissue.

This is a thin crust less than 1 mm thick growing laterally indefinitely. Specimens covering more than 30 square cm were noticed frequently.

The endosome and ectosome color in life was jet black, and the consistency was softly colloidal.

The surface is shiny and smooth, and the pores and oscules so minute and readily closed that they could not be discovered.

There is no sharp separation between endosome and ectosome. There are numerous elongate flagellate chambers about 30 μ in diameter and at least 120 μ long. These chambers are lined with choanocytes, 2 μ in diameter, and unusually thickly crowded together. The chambers are separated from each other, and also supported, by a quantity of amorphous jelly in which amoebocytes can readily be discovered. These are 7 μ in diameter and are crowded with dark pigmented spherules which are about 1 μ in diameter.

This species is unique within the genus *Halisarca* for the shiny jet black color.

The specific name selected is derived from the Greek word meaning black.

ORDER HAPLOSCLERINA Topsent (or HAPLOSCLERIDA*)
FAMILY HALICLONIDAE de Laubenfels
GENUS *ACERVOCHALINA* Ridley
Acervochalina velinea, new

Text Figure No. 30

This species is here represented by the following:

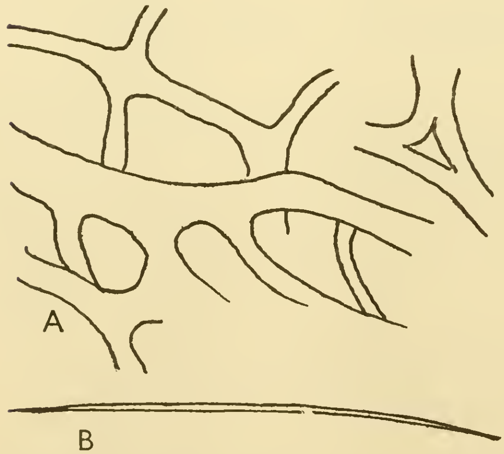
U.S.N.M. No. 22854, My No. M. 148, here designated as type, collected on July 7, 1949, by diver at the southeast side of the lagoon at Ebon Atoll. The depth was about 2 meters, and the substrate was a gorgonian. This is remarkable because gorgonians are quite rare in the shallow waters in this vicinity. A few more specimens, probably of the same species, were observed; but the species could not be described as common.

This species is incrusting, reaching a vertical measurement of about 3 mm and spreading indefinitely over the ramose gorgonian.

The color in life was a light blue on the exterior and very pale drab on the interior. The consistency was softly spongy and notably slimy.

The surface is conulose, but not the sort of fibrous conules which characterize the order Keratosa. Those of the present species are about 0.7 mm high and 1.4 mm apart. The pores are microscopic and apparently close upon death. The oscules are small, about 1.2 mm in diameter, and widely scattered.

Characteristic of the family Haliclonidae, the ectosome is nonexistent. Nearly the same structures that characterize the endosome continue to, and stop at, the surface. The endosome is fibro-reticulate with the soft parts rather widely scattered instead of being densely aggregated.



Text Figure No. 30. *A:* Portion of the fibrous skeleton of *Acervochalina velinea,* X 182.

B: One of the spicules (oxea) of *Acervochalina velinea,* X 781.

* See footnote on page 4.

The skeleton consists of fibers usually about 20 μ in diameter but occasionally thicker, up to perhaps 40 μ. These are of clear spongin resembling that of the commercial sponges. Here and there in these fibers, but quite rare, there are isolated spicules which are thin oxeas, measuring 1 μ by 88 μ.

The genus *Acervochalina* is set off from the genus *Haliclona* by its copious slime production. The type *Spongia limbata* is British and is dull colored. Another species, originally described as *Chalina finitima* by O. Schmidt, is West Indian and also is dull colored. Ridley has recorded the latter from the Indian Ocean and the Australian region. A possibility exists that those thus recorded really belong to the present species and not at all to *finitima*. The present species is set apart from others in the genus by the blue color and almost complete lack of proper spicules.

GENUS *HALICLONA* Grant

This genus is one of the most important in the phylum Porifera, and is also one which is in considerable systematic confusion. It was established by Grant, 1841, page 5, for the species *oculata*. This is a well-known sponge, first described as *Spongia oculata* by Linné, 1759, page 1348. The genus, well characterized by its type, is abundantly represented throughout the tropical oceans, including the territory studied in the present report. These are sponges whose megascleres are only oxeas, which never have any microscleres, and whose surface is peculiarly devoid of any specialization. There are no subdermal canals parallel to the surface, no dermal skeleton; the endosome simply stops and that is the surface. The spicules are always more or less isodictyal in arrangement—connected to one another at their tips by more or less spongin, forming triangular or polygonal meshes on each side of which is a single spicule. There are usually also present fascicular strands of spicules which are more or less encased in cylindrical fibers of spongin. The genotype is a much-branched ramose sponge. Many others are of this type, but about as many sponges which may or may not be congeneric are incrusting.

Are two or more genera involved? Many authors have used a separate name (*Reniera*) for the incrusting forms. As against this, there are species such as *viridis* which is occasionally incrusting although typically ramose. With this species, the difference is certainly ecological. Is it thus for the others? It seems likely (but far from certain) that many species are genetically incrusting. I believe that at least subgeneric status should be maintained for the usually ramose, more fibrous species in contrast to the always (or usually) incrusting, less fibrous species. The fact that some tend toward a middle ground does not constitute refutation, because we have reason to believe that in the geologic past (it not today) intermediates existed between each animal in the world and every other one; this is the premise of evolution.

Individual sponges may lack certain traits, just as individual ants may lack wings, yet their genus and species may be sharply characterized by a type of wing. For example, a special dermis may be proper to a certain sponge genus; but, for reasons which we do not well understand, some individuals of that genus may lose or fail to develop the dermis. Such individuals may be classified incorrectly as *Haliclona.* We should face the fact that solitary specimens of Porifera, if lacking in distinctive characters, should be regarded as unrecognizable.

This same problem concerns microscleres. Some genera, such as *Orina,* are characterized by certain types of microscleres. Yet, now and then an individual *Orina* lacks microscleres and seems to be an *Haliclona.* Burton of the British Museum, therefore, has recently dropped such genera into synonymy with *Haliclona,* implying that it is a genus with microscleres, which sometimes are not present in individuals. *Orina* answers to that description, but *Haliclona* does not. It must be repeated that for sound identification a series of conspecific individuals should be studied in the field. Often this is impossible, but I have been able to study a number of clear-cut *Haliclonas* in just this way.

Problems in nomenclature also exist, as follows:

The most ancient name involved is *Rayneria,* Nardo, 1833, page not numbered (column 519). Nardo said of it, "Aggregata polymorpha magis aut minus porosa et foraminosa, tenacite fere nulla, facile digitis pulverizabilia in sicco. Fulcimenta aculeiformia inconspicua simplicia, dispositione varia materiei animalis ope conjuncta ita ut pulpam uniformem praebeat." He described no species. Therefore, by opinion 46 of the International Commission of Zoological Nomenclature it becomes a sacred genus. They say "if it is NOT evident from the original publication of the genus how many or what species are involved, the genus contains ALL OF THE SPECIES OF THE WORLD which would come under the generic description as originally published, and the first species published in connection with the genus becomes *ipso facto* the type."

Several thousand species, in hundreds of genera, come under Nardo's description. Any one of these may be designated as type and thus bring *Rayneria* into use instead of the later, much used name. Very few sponge generic names antedate 1833, yet only by appealing to one of these can later good generic names be saved from the menace of the name which has been hallowed by its lack, so far, of species.

I, therefore, call attention to specimen number 23201 of the United States National Museum, a sponge collected at Sanak Island, Alaska, by V. B. Scheffer. It answers to Nardo's description of *Rayneria;* and, therefore, I designate it as type of that genus. It is a friable sponge with pores and oscules, with the species name *lacustris,* and may temporarily be referred to as *Rayneria lacustris.* But this species is also typical of the genus

Spongilla, Lamarck, 1815, page 69, which antedates Nardo's 1833 paper. Thus, the genus *Rayneria,* type *Spongilla lacustris,* Linné, 1759, page 1348, falls in synonymy to *Spongilla.*

The second name involved is *Haliclona* Grant, which already has been discussed.

The third name involved is *Reniera,* Nardo, 1833, pages 430-436. Of it, Nardo says, "Il tipo del genere, o Reniera typica, che termina per lo piu in ammassi tubulari, s'incontra pure frequenti." In the writings of Oscar Schmidt, starting in 1862, the genus *Reniera* began to be much used for sponges of the *Haliclona* sort and for other types, too. One gets the impression that Schmidt thought that *Reniera* was equivalent to *Rayneria,* although I cannot find that he ever said so definitely.

Nardo cherished the belief that he could change the names of his genera, but the rules of nomenclature positively do not permit this. Nardo certainly tried to change *Ircinia* to *Hircinia,* but the earlier name must stand. Was *Reniera* just a new spelling of *Rayneria*? Does it therefore fall into synonymy to the earlier name? We cannot take that for granted. Nardo gives a new, albeit very brief, description of *Reniera* and does give it a species. Therefore, I propose that we definitely regard it as a new genus in 1844, not at all synonymous with *Rayneria.*

Reniera typica is ill known, and no one species in existing collections can be positively so identified. Yet, it is clear that it was a tubular sponge. When, as in *Reniera aquaeductus,* Schmidt 1862, we have the genus employed for tubular sponges, the usage may be defended. Actually, Schmidt said of his *aquaeductus* "an dies unser typisches exemplar" and regarded it as the genotype.

The fourth name involved is *Chalina,* Bowerbank, 1862, page 1120. This was established for *oculata,* which was already the type of *Haliclona.* Hence, *Chalina* is obviously a junior synonym.

Still later synonyms of *Haliclona* include *Cavochalina* Carter, *Chalinorhaphis* Lendenfeld, *Chalinula* Schmidt, *Euchalina* Lendenfeld, *Euchalinopsis* Lendenfeld, *Pachychalina* Schmidt, *Pachychalinopsis* Schmidt, *Reniochalina* Lendenfeld, and perhaps others that are not well described.

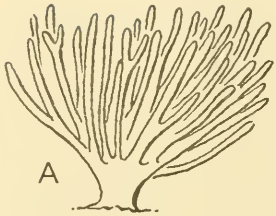
Here we may treat as genus *Haliclona* subgenus *Haliclona,* sponges of ramose form and somewhat fibrous structure.

Haliclona monilata (Ridley) de Laubenfels

Text Figure No. 31

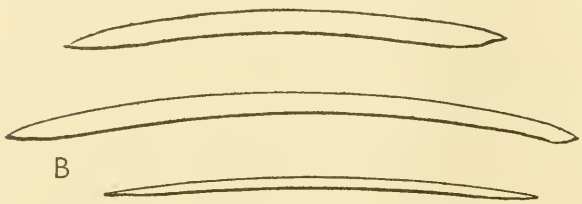
This species is here represented by the following:

U.S.N.M. No. 22904, My No. M. 208, collected August 13, 1949, by diver in Lemotol Bay at the western portion of Truk lagoon. The depth was 4 meters, and the substrate was dead coral.



A

Text Figure No. 31. *A:* Sketch of *Haliclona monilata,* X 1/10; this is NOT a camera lucida drawing.



B

B: Three of the spicules (oxea) of *Haliclona monilata,* X 781.

The shape is distinctively ramose. From a base which is almost incrusting, hundreds of strands arise. Only a few of these branch again and still fewer ever anastomose. These branches are about 4 mm in diameter and reach a vertical height of at least 30 mm. Therefore, in all a relatively enormous sponge colony results.

The exterior and interior color in life was ochre. The consistency was spongy.

The surface is micro-velvety. The pores are 50 μ to 90 μ in diameter and about 130 μ apart, center to center. The oscules are about 1.5 mm in diameter and are distributed along the strands at distances about 4 cm apart.

The ectosome is absent, of course. The endosome is a very vague reticulation, because most of the spicules are in confused arrangement; but they are placed so that they outline the canals and chambers. The latter are quite evident.

The skeleton contains only a small quantity of spongin, and yet that appears to be very efficient in producing the spongy consistency. The spicules are oxeas, of considerable variation in size. Representative dimensions may be cited as 4 μ by 80 μ, 3 μ by 100 μ, and (probably juvenile) 1.5 μ by 75 μ.

This species was first described as *Chalina monilata* by Ridley, 1884, page 394, from Australia. Brøndsted in 1934, page 12, described a sponge from the East Indies as *Chalina bandae.* His description shows no considerable difference from *monilata* and, therefore, is dropped here in synonymy to Ridley's species. A somewhat related form, not now dropped in synonymy, was first described as *Reniera ramusculoides* by Topsent, 1893, page 181, from the Red Sea. It should be in *Haliclona,* of course. *Chalina minor,* described also from the Red Sea by Row, 1911, page 323, is dropped here in synonymy to *Haliclona ramusculoides.*

Haliclona ligulata (Whitelegge) de Laubenfels

Text Figure No. 32

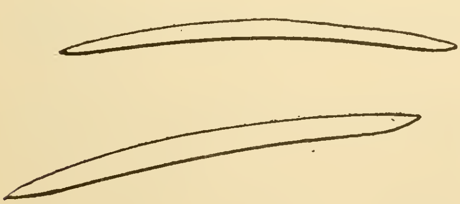
This species is here represented by the following:

U.S.N.M. No. 23144, My No. M. 528, collected September 20, 1949, by diver in northwestern Guam, northeast of Agana, at Dungas Beach. The depth was less than 2 mm, the substratum dead coral, or shells. The species was common in this one locality.

The shape is lobate, the lobes about 1 cm in diameter and from 1 mm to 6 cm high. A common measurement is 1 by 1 by 3 cm. The total diameter of the sponge is often as much as 14 to 18 cm. The total vertical measurement is often as much as 8 or 10 cm.

The color varied in life from dull violet to violet-gray. Deeper buried portions might be drab, probably being moribund. The consistency was spongy.

When out of water, the surface appears punctiform, because the flesh sinks in at the skeletal pores. These are 200 μ or 300 μ in diameter and separated from each other only by fibers which are about 20 μ to 60 μ in diameter. Each such skeletal pore is filled with a thin protoplasmic structure, perforated by abundant genuine pores of very great variation in size (from 10 μ to 100 μ in diameter). The oscules are about 2 mm in diameter and about 3 cm apart, center to center.



Text Figure No. 32. Two of the spicules (oxea) of *Haliclona ligulata*, X 781.

There is no ectosome other than the above-mentioned dermis, and the endosome is the usual fibro-reticulation of the family Haliclonidae.

The skeleton consists of spongin fibers, about 20 μ to 60 μ in diameter, cored by oxeas which range from 3 μ by 68 μ to 4 μ by 72 μ.

The species with which the present specimens are here synonymized was first described as *Chalina ligulata* by Whitelegge, 1901, page 74, from Australia. Whitelegge does not describe the type of dermis that is here found, and it may be possible that a new species should be erected for this sponge, which is so very characteristic of the fauna of the island of Guam.

Haliclona streble, new

Text Figure No. 33
Plate XI, Figure a

This species is here represented by the following:

U.S.N.M. No. 23139, My No. M. 523, here designated as type, collected on September 15, 1949, by diver in the lagoon southwest of Saipan, just offshore from Charan Kanoa Village. The depth was 2 meters, and the substrate was dead coral. It was not near the reef, but instead very close to the shore which was quite steep at that point. In this limited locality this species was very common.

The shape is irregularly ramose, the branches have an average diameter of about 4 mm, but are exceedingly lumpy, contorted, and irregular in outline. A vertical measurement of at least 6 cm is attained.

Text Figure No. 33. Three of the spicules (oxea) of *Haliclona streble*, X 781.

The color in life was dull purple, and the consistency was fragile, but somewhat spongy.

The surface is obviously punctiform, as in the preceding species, due to the fact that when removed from water the protoplasmic structure sinks down into the skeletal pores. The latter are about 120 μ by 180 μ in diameter and filled in with a fleshy dermis which is abundantly perforated by the genuine pores. These are about 15 μ to 30 μ in diameter. The oscules are about 1 mm in diameter and occur in a crooked row along each branch at a distance of about 1 cm apart.

The ectosome is haliclonid and otherwise much the same as in the preceding species. The endosome is the usual fibro-reticulation with rather scattered soft parts.

The skeleton consists of a very uniform reticulation of spongin fibers usually about 40 μ in diameter but, in extreme cases, ranging from 30 μ to 80 μ in diameter. The mesh extends from about 100 μ to 250 μ in diameter but is usually about 150 μ to 200 μ. These fibers contain scattered oxeas, which are usually 3 μ by 66 μ to 3.5 μ by 77 μ in dimensions. Occasional much smaller ones are probably juvenile.

This new species is most sharply set off by the extremely contorted and lumpy structure. The pore sieves also are unusual in the genus *Haliclona*. They were described in the preceding species, but have been noted in very few, if any, others. The lack of isodictyal structure in *streble* is also noteworthy. Kirk in 1911, page 576, described a sponge as *Chalina fistulosa* from the islands north of New Zealand and east of Australia. It had skeletal

fibers and spicules much like those of *streble,* although massive instead of ramose, but observed only from one specimen, so damaged and macerated that most of the characteristics are not known. The peculiar dermis of *streble* would seem to indicate a little relationship to *ligulata.* Among all the many species described in this genus, none can be found really close to *streble,* which is therefore exceptionally worthy of distinction.

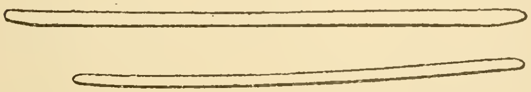
Haliclona koremella, new

Text Figure No. 34

This species is here represented by the following:

U.S.N.M. No. 23129, My No. M. 512, here designated as type, collected on September 6, 1949, by using a fish spear, in Iwayama Bay near Ulebsechel Island in the Palau Archipelago. The depth was 2 meters, and the substrate was dead coral.

The shape is ramose. From a very small central basal attachment, almost a point, scores of branches arise. These are about 3 or 4 mm in diameter and reach a total height of at least 30 cm. Only a few of them branch at all, and there are no anastomoses. The total specimen constitutes a bush in horizontal measurement of about 40 by 40 cm.



Text Figure No. 34. Two of the spicules (strongyles) of *Haliclona koremella,* X 781.

The color in life was blue to blue-green, and the consistency spongy but easily torn.

The surface is smooth, not shiny, and is micro-punctiform, which is very typical of the family Haliclonidae. The pores are microscopic and contractile. The oscules are less than 1 mm in diameter and set in a row, usually on just one side of the erect strand, about 6 mm apart, center to center.

As might be expected, the ectosome is nonexistent. The endosome is a fibro-reticulation with scattered soft parts and rather conspicuous interstitial spicules.

The skeleton consists of fibers forming a rather rectangular reticulation. The ascending tracts are about 100 μ in diameter and contain 4 to 7 spicules per cross-section. These fibers terminate at the surface in microscopic little projections of conulose shape. The transverse fibers are only about 15 μ in diameter, and they seldom contain any spicules. As noted above, very many of the spicules are not in the fibers at all, but are loose in the flesh. These spicules are strongyles, 2 μ by 78 μ to 2 μ by 88 μ in dimensions.

Out of the very many species of the genus *Haliclona,* several may be compared slightly to the present one, although none are extremely close.

Topsent, 1892, page xviii, described *Chalina zostericola* from the Mediterranean. Its spicules were oxeas, its form vague, and its color brown, although in other respects it was something like *koremella.* Dendy, 1895, page 244, described *Chalina viridis* from the Australian region. This was dark green, but its spicules much thicker and shorter, and it had a very peculiar structure of canals and very different habitus.

De Laubenfels, 1936, page 42, transferred *Amphimedon viridis* Duchassaing and Michelotti, 1864, page 81, into *Haliclona.* Consequently, a new name must be found for *Chalina viridis* of Dendy, and it is proposed here that it be *viridola.*

There is another case of a need for a new name in the genus *Haliclona.* Thiele, 1905, page 477, described *Acervochalina variabilis,* which was transferred to *Haliclona* by Burton, 1932, page 265. This name was preoccupied by *Pachychalina variabilis* Dendy, 1890, page 353, which was transferred to *Haliclona* by de Laubenfels, 1936, page 39. It is proposed here that *variabilis* of Thiele be known henceforth as *variabola.* Neither of these two latter species are closely related to *koremella,* which is well set apart by its strongylote megascleres, in connection with the numerous other points of difference enumerated. Some very curious comparisons, however, may be made between *koremella* and the following species or *korema.*

The species' name is a diminutive of the name *korema.*

Haliclona korema, new

Text Figure No. 35

This species is here represented by the following:

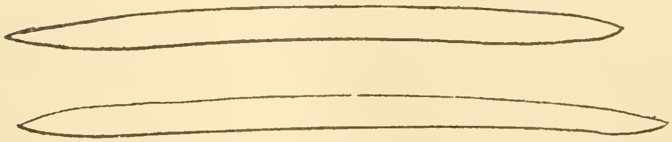
U.S.N.M. No. 23132, My No. M. 515, here designated as type, collected September 6, 1949, by using a fish spear in Iwayama Bay near Ulebsechel Island in the Palaus. The depth was less than 2 meters, and the substrate was dead coral.

U.S.N.M. No. 22797, My No. N. 002, collected April 25, 1946, by J. P. E. Morrison at Bikini Atoll near the east end of the lagoon, 7 kilometers south of the west end of Bikini Islet. This was done by dredging from a depth of 50 meters. Substrate was not mentioned.

U.S.N.M. No. 22801, My No. N. 006, collected at the same time and place as the preceding.

U.S.N.M., No. 22825, My No. N. 032, collected July 11, 1946, by J. P. E. Morrison at Bikini Atoll near the east end of the lagoon. This was done by dredging from a depth of 50 meters.

The shape is like that of *koremella,* with a small base from which numerous upright branches arise. Each of these is about 2 mm in diameter and 5 cm high, and only a few of them branch at all after leaving the focal point or base.



Text Figure No. 35. Two of the spicules (oxea) of *Haliclona korema,* X 781.

The color in life was dull, dark green, and the consistency fragile and slightly spongy.

The surface is somewhat velvet-like but otherwise typical of the family Haliclonidae. The pores are microscopic and contractile. The oscules are about 1 mm in diameter and 1 cm apart and scattered.

The ectosome is nonexistent; and the endosome, utterly unlike that of *koremella,* is dense and full of isodictyal reticulation. Here and there a central hollow, almost like a cloaca, may be found.

As mentioned above, the skeleton consists of an isodictyal reticulation of rather large oxeas, 4 μ by 112 μ to 5 μ by 110 μ in dimensions. A very few are as thick as 6 μ. There are no fibers, not even any definite spicule tracts. In only very few places are spicules aggregated even into bundles.

A very curious situation obtains in comparing this species *korema* with the preceding or *koremella,* inasmuch as each occurred in the same general vicinity. The shape of the two species is remarkably similar; and the color is somewhat similar, although *koremella* is blue to blue-green and *korema* is definitely green. Internally the two species are so utterly different that one might argue that they should belong in different genera. They represent absolutely two extremes of variation within the genus *Haliclona.* Furthermore, the spicules are extremely different. Many species of the genus *Haliclona* have a spiculation much like that of *korema,* but all have some points of difference. For example, there is the species which was first described as *Reniera fryetti* by Dendy, 1895, page 238, from eastern Australia. Its spicules are like those of *korema* but are sometimes arranged into tracts. The pores are grouped into sieves; the general shape is erect, thick, and flabellate; and the color is brown instead of green. *Korema* may be regarded as a well distinguished species of the genus *Haliclona.*

Four specimens from Bikini are referred here with reservations. No data was available for them as to the color in life. It is my considered opinion that within the genus *Haliclona* the color in life has considerable taxonomic significance. The four do not fit nicely any other species, however; and they exhibit no difference from *korema,* insofar as they can be studied.

The species' name is derived from a Greek word meaning "mop," and refers to the mop-like structure of the colony.

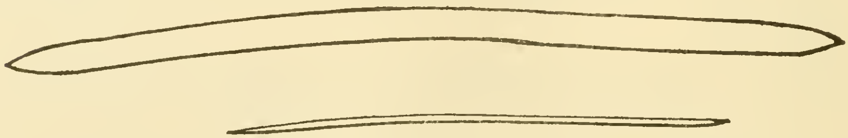
Haliclona coerulescens (Topsent) de Laubenfels

Text Figure No. 36

This species is here represented by the following:

U.S.N.M. No. 23071, My No. M. 451, collected August 10, 1949, by diver at the north side of Moen Islet in the Truk lagoon. The depth was 2 meters and the substrate was dead coral.

The shape of this specimen is a rounded mass, 2 cm thick and 9 cm in diameter.



Text Figure No. 36. Two of the spicules (oxea) of *Haliclona coerulescens,* X 781.

The color in life was a rich ultramarine blue, verging slightly toward violet. The color of the endosome was the same as that of the ectosome. The consistency was spongy but easily torn.

The surface is typically haliclonid. The pores are 50 μ to 120 μ in diameter and are about 250 μ apart, center to center. The oscules are about 5 mm in diameter and not much more than 1 cm apart, being very abundantly distributed over the entire upper and lateral surfaces of the mass.

As might be expected, the ectosome is nonexistent and the endosome is a fibrous-reticulation.

The skeleton consists first of spongin fibers from 25 μ to 100 μ in diameter. These form meshes of extreme irregularity in size and shape and contain, here and there, scattered spicules. Some portions of the fibers are devoid entirely of coring material; in other cases there is a single row of spicules; and in still other places there are groups of three or four spicules. The latter are diactinal but so bluntly pointed that they may rather be called tornote than simply oxeas. Very many of them are 6 μ by 144 μ in dimensions, but almost as many are only 1 μ by 88 μ. Does this latter constitute a separate category? If so, would this perhaps take the species out of the genus *Haliclona,* as well as providing a reason for regarding this as a new species instead of identifying it with *coerulescens*?

Topsent, 1918, page 537, described *Reniera coerulescens* from the West Indian region; and de Laubenfels, 1936, page 39, transferred this to *Haliclona.* It seems remarkable to find the species occurring in the Western Pacific, but there are other instances of such distribution. If the thinner category of spicules (as mentioned above) constitute a regular portion of the complement in West Pacific species, as might be indicated if additional specimens were available, then the synonymy should not be completed. But inasmuch as the

smaller spicules may merely be juvenile forms, the present specimen is identified with *coerulescens.* In practically every respect other than the thin spicules it agrees remarkably with the West Indian forms described by Topsent.

Haliclona viridis (Duchassaing & Michelotti) de Laubenfels

Text Figure No. 37

This species is here represented by the following:

U.S.N.M. No. 22950, My No. M. 323, collected June 24, 1949, by diver at Ailing-lap-lap Atoll at the east end of the lagoon near Jih Islet. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 23028, My No. M. 407, collected July 30, 1949, by diver in the lagoon in northwest Ponapé. The depth was 5 meters, and the substrate was dead coral.

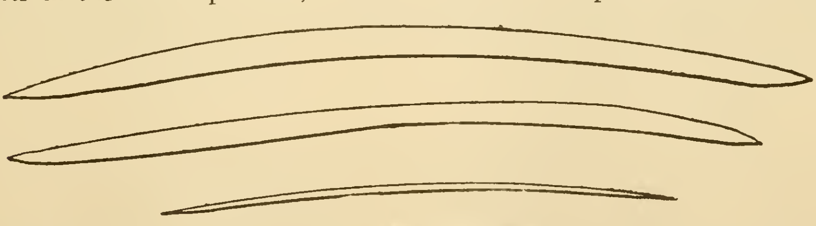
U.S.N.M. No. 22895, My No. M. 197, collected August 10, 1949, by diver at the west side of Moen Islet in Truk lagoon. The depth was 2 meters, and the substrate was underside of dead coral.

U.S.N.M. No. 22927, My No. M. 233, collected September 2, 1949, by diver in the Palaus northwest of Koror near Ngarebagal Islet. The depth was 3 meters, and the substrate was dead coral.

This sponge was fairly common at the east end of the Ailing-lap-lap lagoon, and not common in the other regions studied, although widely distributed.

The four specimens may be described as follows: first, amorphous with lobes 6 cm high; second, a mass with finger-shaped processes 11 cm high; third, semi-incrusting; and, fourth, ramose with branches 1 by 2 cm in cross section and 14 cm high. All these shapes are quite typical of the species *viridis.*

The color in life was medium to bright green; in some cases that of the interior was slightly paler than that of the exterior, although in other cases the endosome had the same tint or hue. The consistency was consistently somewhat spongy and usually fragile and easily torn, but a curious exception exists in the Truk specimen, which lacked the erect processes and was not



Text Figure No. 37. Four of the spicules (oxea) of *Haliclona viridis,* X 781.

easily torn. This may mean that it was of another species, only superficially similar. On the other hand, it more likely represents an ecological modification. As noted above this specimen was growing on the underside of a mass of dead coral and may have grown very slowly.

The surface is level, punctiform, and quite typical of the genus *Haliclona.* The pores are large, up to as much as 600 μ in diameter, and often about 1.3 mm apart. The oscules range from 1 to 8 mm in diameter but are commonly between 3 and 7 mm in diameter and 1 to 2 cm apart. Typically, there is a low rim around the oscule, but this is not always present, probably for ecological reasons such as strength of current at the point of growth.

The ectosome is nonexistent, and the interior is principally an isodictyal reticulation with protoplasmic structures more common than in other members of the genus *Haliclona.* The flagellate chambers are spherical, about 25 μ in diameter.

The skeleton is principally isodictyal and is built of oxeas which fall loosely into two ill-defined categories. Those of the larger size are about 4 μ by 130 μ to 5 μ by 140 μ in dimensions. Some are as large as 6 μ by 130 μ. The smaller sizes of oxeas may range from 0.5 μ by 45 μ to 3 μ by 124 μ. A distinct possibility exists that these are juvenile, but in all parts of the world there is a general tendency toward this loose grouping into two spicule sizes within the species *viridis.* In addition to the isodictyal reticulation, there are more or less vague tracts which make a large-meshed reticulation if considered by themselves. These tracts are often about 25 μ in diameter and contain six spicules per cross section.

This species was first described as *Amphimédon viridis* by Duchassaing and Michelotti, 1864, page 81, from the West Indian region. It was transferred to *Haliclona* by de Laubenfels, 1936, page 42. It is extremely abundant in the West Indian region. In 1911, page 316, Row described a sponge from the Red Sea as *Reniera tabernacula.* Burton in 1937, page 18, transferred this appropriately to the species *viridis,* which seems therefore to be a circumequatorial species. In this 1937 reference, Burton regards *viridis* as type of a genus *Hemihaliclona,* but the relationship to the type of *Haliclona,* that is to say *H. oculata,* is so close that there does not seem to be adequate reason for establishing a second genus. On the other hand, the genus *Haliclona* has become so large as to be unwieldy, so that for purposes of convenience, if nothing else, a further subdivision of it may be wise.

SUBGENUS *RENICLONA,* new

The genus *Haliclona* has now about two hundred species names. A few are not well known, and others will doubtless prove to be synonyms; but the residue remains uncomfortably close to two hundred.

After much field study, it seems reasonably clear that two categories of species do exist within this large group. It may be argued that intermediate categories also exist and that there are undoubtedly specimens difficult to allocate. While this is true, we notice that, as nature is more thoroughly studied, additional intermediates are repeatedly found—often so many interconnecting genera occur that even a three-dimensional representation of the result would be a bewildering maze. Because *Haliclona* specimens do fall into two natural groups and because the two hundred species' size is distressingly unwieldy, *Reniclona* is here established to have as its type the species originally described as *Isodictya permollis* by Bowerbank, 1866, page 278, and transferred to *Haliclona* by de Laubenfels, 1936, page 40.

Reniclona is here described as persistently incrusting, never ramose. Juvenile specimens of *Haliclona* (which later becomes ramose), may temporarily be incrusting; and, therefore, it follows that small, juvenile specimens may be very difficult to allocate. Another difference is that *Reniclona* specimens are quantitatively more isodictyal and less fibrous than are specimens of *Haliclona,* which in contrast are less isodictyal and more fibrous. No hard and fast line can be drawn, but the suggestion is made that in case of doubt as between the two any ramose sponge should certainly be regarded as *Haliclona* even though it is isodictyal.

Some six species of the new subgenus *Reniclona* are found in the western Pacific area covered in the present paper. In addition to this, a number of species now in *Haliclona* (or in *Reniera*) should definitely be regarded as in the new subgenus. They are listed as follows:

Chalina intersepta Topsent
Chalinula robustior Schmidt
Halichondria condensa Bowerbank
Halichondria palmata (Lieberkühn not Johnston)
Haliclona enamela de Laubenfels
Haliclona erina de Laubenfels
Haliclona lunisimilis de Laubenfels
Haliclona stephensi Burton
Isodictya anomala Bowerbank
Isodictya clava Bowerbank
Isodictya crassa Bowerbank
Isodictya densa Bowerbank
Isodictya ferula Bowerbank
Isodictya gregorii Bowerbank
Isodictya incerta Bowerbank
Isodictya indefinita Bowerbank
Isodictya indistincta Bowerbank
Isodictya luteosa Bowerbank
Isodictya mcandrewii Bowerbank
Isodictya obscura Bowerbank
Isodictya pallida Bowerbank
Isodictya parasitica Bowerbank
Isodictya paupercula Bowerbank
Isodictya peachii Bowerbank
Isodictya permollis Bowerbank
Isodictya perplexa Bowerbank
Isodictya pocillum Bowerbank
Isodictya pygmea Bowerbank
Isodictya rosea Bowerbank
Isodictya simplex Bowerbank
Isodictya simulo Bowerbank
Isodictya tenera Marenzeller
Pachychalina grantii Lendenfeld
Pachychalina montaguii Ferrer Hernandez
Pachychalina oblonga Vanhoffen
Reniera accomodata Schmidt

Reniera alba Schmidt
Reniera algicola Thiele
Reniera altera Topsent
Reniera anceps Thiele
Reniera arctica Mereschewski
Reniera australis Lendenfeld
Reniera bawdiana Lendenfeld
Reniera boutschinskii Kudelin
Reniera citrina Topsent
Reniera compacta Schmidt
Reniera cribriformis Ridley
Reniera curiosa Swarchewsky
Reniera decidua Topsent
Reniera depressa Topsent
Reniera firma Swarchewsky
Reniera flavescens Topsent
Reniera foraminosa Topsent
Reniera foraminosa Thiele—(The new name *foraminota* is here proposed for this. See Thiele, 1905 p. 465)
Reniera fulva Topsent
Reniera heterofibrosa Lundbeck
Reniera inepta Thiele
Reniera inflata Schmidt
Reniera informis Schmidt
Reniera infundibuliformis Hansen
Reniera innominata Kirkpatrick
Reniera kerguelensis Hentschel
Reniera latens Topsent
Reniera laxa Lundbeck
Reniera lenis Topsent
Reniera lobosa Lendenfeld
Reniera macropora Thiele
Reniera merejkowskii Swarchewsky
Reniera mollis Baer (The new name *mollita* is here proposed for this. See Baer 1905, p. 14.)
Reniera mollis Lambe
Reniera moniliformis Wisniowski
Reniera nigra Burton
Reniera nigricans Czerniavsky
Reniera odessana Kudelin
Reniera parietalis Topsent
Reniera penicillata Topsent
Reniera pigmentifera Dendy
Reniera plana Topsent
Reniera pons Schmidt
Reniera porosa Whitelegge
Reniera porrecta Schmidt
Reniera proletaria Topsent
Reniera pulvinar Topsent
Reniera reversa Kirk
Reniera ridleyi Keller
Reniera rossica Hentschel
Reniera rufescens Lambe
Reniera rugosa Thiele
Reniera solowetzkaja Hentschel
Reniera sordida Thiele
Reniera spiculotenuis Topsent
Reniera spitzbergensis Hentschel
Reniera spongiosa Topsent
Reniera stirpescens Topsent
Reniera subglobosa Ridley and Dendy
Reniera sucholimanskaja Kowalsky and Sobol
Reniera swartschewskiji Hentschel
Reniera topsenti Thiele
Reniera tromsoica Hentschel
Reniera tuberosa Dendy
Reniera tubifera George and Wilson
Reniera tufa Ridley and Dendy
Reniera tufoides Dendy
Reniera verrucosa Thiele
Reniera virens Topsent
Reniera viscosa Topsent
Reniera voeringii Lundbeck
Reniera zoologica Dendy
Spongia sowerbii Fleming
Thalysias massalis Carter

Reniclona permollis (Bowerbank) de Laubenfels

Text Figure No. 38

This species is here represented by the following:

U.S.N.M. 23035, My No. M. 414, collected July 30, 1949, by diver in the lagoon in northwest Ponapé. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 23060, My No. M. 440, collected August 3, 1949, by diver in southwest Ponapé (Kiti) in the lagoon near Toletik Islet. The depth was 4 meters, and the substrate was a living sponge of the genus *Neopetrosia.*

The shape is incrusting with a vertical measurement of less than 1 cm but with indefinite lateral spread. A width of at least 15 cm is reached.

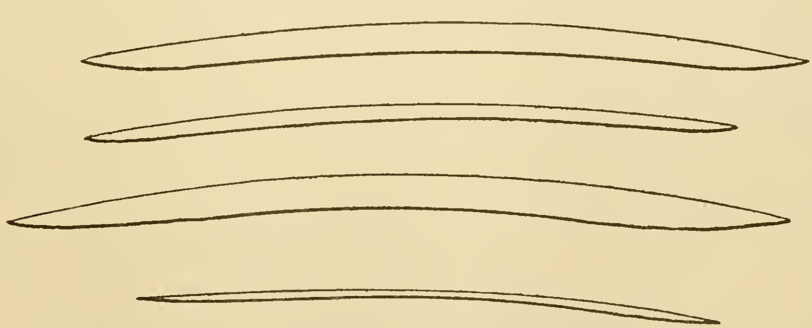
The color in life was between lavender and drab, the latter portions being perhaps pathological. The interior had the same color as the exterior. The consistency was softly spongy; and, upon being collected, the sponge exuded some slime.

The surface is more or less level but obviously punctiform. The items visible to the naked eye are skeletal pores about 500 μ in diameter, containing each a number of perforations in a membrane (the perforations probably representing the real pores, which are in this case 50 μ to 100 μ in diameter). The oscules are very few in number and characterized by quite a noticeable rim. Their diameter ranges from 2 to 4 mm.

There is the usual lack of ectosome, and the endosome is an isodictyal reticulation of spicules, with rather scanty protoplasmic structures.

The skeleton consists of oxeas, about 5 μ by 135 μ in dimensions. A few that are thinner are probably juvenile forms.

The second Ponapé specimen was gray to drab when collected. Upon histological examination, it proved to have been moribund. In other respects, it agreed quite closely with No. M. 414.



Text Figure No. 38. Four of the spicules (oxea) of *Reniclona permollis,* X 781. (Specimen M. 440).

Bowerbank, 1866, page 278, described *Isodictya permollis* from Great Britain. It was soon evident to students of sponges that in almost all portions of the oceans of the world, within shallow water or intertidal regions, a very common lavender sponge flourished. This was at first thought to be that which was first described as *Spongia cinerea* by Grant, 1826, page 204, and transferred to *Reniera* by Schmidt, 1870, page 77. Thus, the literature became full of abundant references to *Reniera cinerea*. Burton, however, in 1934, page 534, showed that *cinerea* was not as described, but instead the genotype specimen belonged in the genus *Adocia*. The next species name available for the cosmopolitan sponge appears to be *permollis* of Bowerbank.

The species *permollis* is certainly abundant on both sides of the Atlantic Ocean, north even into the near-Arctic. It is abundant also on the eastern coast of the Pacific Ocean. Numerous sponges from the western Pacific region have been recorded as of the genus *Reniera* (or *Haliclona*), that is to say *Reniclona,* but unidentifiable as to species. It is here considered probable that many of these are really *permollis*.

One might say that the species *permollis* was an extremely variable one, but another decided possibility to consider is that it is a species which may fall victim to various types of ailments. There are excellent indications that when perfectly healthy it has a characteristic violet color. When anything goes wrong, such as the advent of fresh water (see de Laubenfels, 1947, page 41), the lavender is easily replaced by various shades of brownish or grayish drab. The shape is consistently incrusting; the surface (as noted above) is obviously punctiform; the matter of presence or absence of collars around the oscules is clearly related to environmental circumstances (the stronger the current the less the collar and the quieter the water the higher the collar). The consistency and isodictyal structure are also consistent. European specimens tend to have spicules only 3 μ by 90 μ to 5 μ by 100 μ in dimensions, according to my field observations. Four by 110 μ is perhaps the commonest spicule size. On both coasts of the Americas, however, the spicules are a little larger, about 6 μ by 145 μ to 8 μ by 160 μ. The western Pacific specimens here treated are intermediate, therefore, between American and European ones.

The species *permollis* may be fairly common throughout the western Pacific region, because during the summer of 1949 numerous small incrusting lavender sponges were noticed. Only a few of these were collected. Such small specimens are difficult to detach. Being small to begin with and frequently damaged in addition, they are likely to lack distinguishing characteristics. Perhaps some day some investigator with unlimited time at his disposal might devote several months to a study of such obscure little sponges. It is suggested here that he probably will discover that a large percentage of them are immature or handicapped representatives of *permollis*.

The sponge described as *Reniera reversa* by Kirk, 1911, page 575, from

New Zealand, obviously cannot be a *Reniera* or *Reniclona,* because it has large erect dermal styles. It certainly appears to be of the family Axinellidae, but the genus is rather difficult to decide upon. With some hesitation, it is here transferred to the genus *Pseudotrachya.*

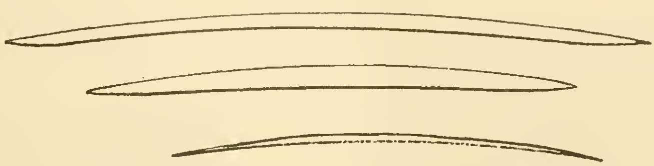
Reniclona decidua (Topsent) de Laubenfels

Text Figure No. 39

This species is here represented by the following:

U.S.N.M. No. 22896, My No. M. 198, collected August 10, 1949, by diver on the west side of Moen Isle in Truk lagoon. The depth was 2 meters, and the substrate was dead coral.

This is an incrusting sponge, 3 mm thick, covering an area of at least 100 square cm.



Text Figure No. 39. Three of the spicules (oxea) of *Reniclona decidua,* X 781.

The color in life was purple, and the consistency very soft.

The surface is level, typical of the genus *Reniclona.* The pores are microscopic. The oscules are small; only two occurred on the present specimen. These were about 2 mm in diameter.

There is no ectosome, and the endosome is the usual isodictyal reticulation.

The skeleton consists of oxeas, varying from about 2 μ by 112 μ to 3 μ by 83 μ in dimensions.

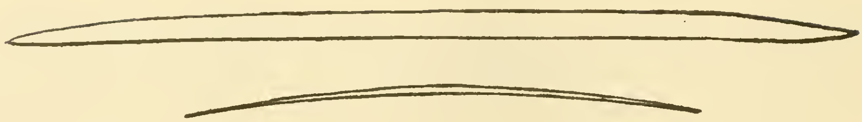
Topsent, 1906, page 560, described *Reniera decidua* from the Red Sea. The present specimen is identified rather confidently with *decidua,* but the notation must be made that this is a sponge of the *permollis* type and some possibility exists that in the long run *decidua* and the present specimen should be dropped in synonymy to *permollis.* This step is not taken at the present time.

Reniclona parietalis (Topsent) de Laubenfels

Text Figure No. 40

This species is here represented by the following:

U.S.N.M. No. 22868, My No. M. 163, collected July 11, 1949, by diver at Likiep Atoll in the east end of the lagoon near Lado Island.



Text Figure No. 40. Two of the spicules (oxea) of *Reniclona parietalis,* X 781.

The depth was 5 meters and the substrate was dead coral.

This is an incrusting sponge 6 mm thick and has a total horizontal measurement of only 1 by 3 cm. The color in life was pale drab, and the consistency very softly spongy.

The surface is uneven, somewhat conulose, but punctiform between the conules, with obvious pores about 200 μ in diameter. The oscules cannot be discriminated from the pores.

There is no ectosome, and the endosome is a typical isodictyal reticulation.

The skeleton consists of oxeas 4 μ by 150 μ in dimensions, and others (which may be juvenile) only 0.5 μ by 90 μ.

Topsent, 1894, page xxxix, described *Reniera parietalis* from the Mediterranean. With some hesitation, the present specimen is regarded as conspecific with this European form. There is also a decided possibility that this is a pathological or moribund specimen of *permollis. Parietalis* certainly belongs in the same group with *permollis.*

Reniclona nigra (Burton) de Laubenfels

Text Figure No. 41

This species is here represented by the following:

U.S.N.M. No. 22850, My No. M. 144, collected July 5, 1949, by diver at Ebon Atoll in a miniature lagoon in the south corner of the lagoon. The depth was 2 meters, and the substrate was coralline algae.

The sponge, filling the interstices in a ramose alga, might be described as amorphous. There was a total mass about 3 by 4 by 5 cm.

The color in life was black, but not glistening. The interior was the same color as the exterior. The consistency was mediocre.

The surface is punctiform with obvious pores about 200 μ in diameter. The oscules were not distinguishable from the pores.

There is no ectosome, and the endosome is an isodictyal reticulation.

The skeleton consists entirely of sharp-pointed oxeas, about 3 μ by 127 μ. There are astonishingly few spicules in this specimen.

Text Figure No. 41. One of the spicules (oxea) of *Reniclona nigra,* X 781.

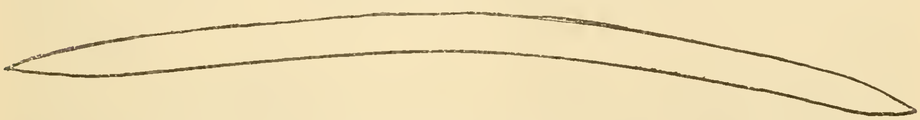
Burton in 1929, page 70, described *Reniera nigra* from the west coast of Africa. His description agrees so closely with this sponge from Ebon that it is not considered advisable to erect a new species here, although it is somewhat doubtful that the sponge from the west Pacific is really identical with that from Africa.

Reniclona massalis (Carter) de Laubenfels

Text Figure No. 42

This species is here represented by the following:

U.S.N.M. No. 22991, My No. M. 369, collected July 7, 1949, by diver in Ebon Atoll near the southeast portion of the lagoon. The depth was 2 meters, and the substrate was a gorgonian, which was a bush-like form, 1 meter high, 1 meter wide, and had more than 200 branches.



Text Figure No. 42. One of the spicules (oxea) of *Reniclona massalis,* X 781.

The shape of this sponge is incrusting with a vertical measurement of 3 cm. It is laterally indefinitely spreading, to at least a width of 11 cm.

The color in life was pale mahogany to a depth of 2 mm. Below that the endosome was very pale drab. The consistency was crumbly.

The surface is rough but very even. The pores are microscopic and closed, and the oscules are 3 mm in diameter, obviously at once branching into conspicuous vertical canals. These oscules are several cm apart.

There is no ectosome. The endosome is an isodictyal reticulation, but it is astonishingly full of protoplasmic structures as compared to other members of the genus *Reniclona.*.

The skeleton consists of oxeas 6 μ by 160 μ in dimensions.

This distinctive species was described as *Thalysias massalis* by Carter, 1886, page 50, from Australia. The present record is the first one from other than Australian localities.

Reniclona rotographura, new

Text Figure No. 43

This species is here represented by the following:

U.S.N.M. No. 23009, My No. M. 389, here designated as type, collected on July 11, 1949, by diver at Likiep Atoll at the east end of the lagoon, near Lado Islet. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 23010, My No. M. 390, collected at the same time and place as the preceding.

U.S.N.M. No. 23011, My No. M. 391, collected at the same time and place as the preceding.

U.S.N.M. No. 23012, My No. M. 392, collected at the same time and place as the preceding.

At the time of collection, it was realized that these four specimens might be conspecific, but they showed four types rather more different from one another than is commonly found within a single species of sponge. Numerous other specimens were observed in the field in this one locality, but all fell into one or the other of four categories, illustrated by the four preserved specimens. Histological study has indicated the essential inter-relationship.

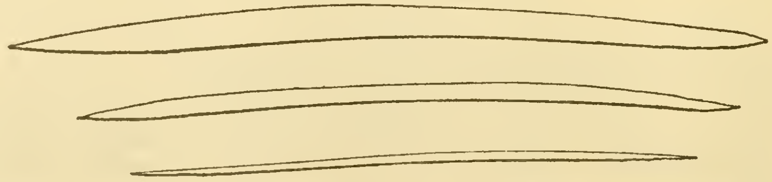
The shape is incrusting to massive, most of the specimens being under 3 mm thick; but No. M. 391 reached a total thickness of 5 cm. The thicknesses were often about 10 cm but spread laterally indefinitely. No. M. 390 was growing on ramose coral and fairly well covered a bush-like structure.

In life, all the specimens were a vivid dark rich brown on the exterior. All were of the same color in the interior, with the exception of M. 392, of which the endosome was orange, but M. 391 contained (in the endosome) very numerous orange embryos, 300 μ in diameter. The consistency was mediocre.

The surface is punctiform with obvious pores, 200 μ to 300 μ in diameter, and with about one pore per each square mm. It is paradoxical to note that the thicker specimen is lipostomous so that on it no oscules are to be seen, whereas they are obvious in specimens M. 389 and 392. Yet, in these it is not so much that the oscule itself is obvious, having been closed at the time of death, but rather that its location is marked by the convergence of a series of grooves (due to exhalant canals) forming a stellate pattern. These oscules are 1 to 2 cm apart.

There is the usual haliclonid lack of ectosome. The endosome is a vaguely isodictyal reticulation but is densely crowded with protoplasm, as in *massalis,* and unlike most specimens of *Reniclona.*

The skeleton consists exclusively of oxeas for spicules but also includes obvious quantities of spongin. The latter not only connects spicules end to



Text Figure No. 43. Three of the spicules (oxea) of *Reniclona rotographura,* X 781.

end in the isodictyal reticulation but, here and there, unites them into vague tracts of one to three spicule rows only. In Specimen No. M. 389, some of these tracts are so large that they reach a diameter of 20 μ. In this specimen such fibers are about 100 μ apart, running perpendicular to the surface. The spicules are commonly about 5 μ by 110 μ to 6 μ by 125 μ in dimensions. A few which are thinner, i.e., only 2 μ by 100 μ, are probably juvenile forms.

This species may be sharply characterized by its remarkable pigment, which not only imparts the vivid color to the sponge, but has stained a dark mahogany color all the labels which were put with the specimen. Comment was made that specimen M. 392 had an orange endosome; this may be accounted for by the presence in the endosome of abundant Cyanophyceae, which are conspicuous in the microscopic preparations of only this specimen. On the other hand, the occurrence of bright orange embryos may indicate that the exceptional color of No. M. 392 was associated with a reproductive condition. Another distinctive feature of *rotographura* is the very fleshy endosome.

The species *rotographura* appears to be confined not merely to Likiep Atoll but to only the eastern portion of its lagoon. Comment needs to be made, however, upon the fact that many collections studied as representing the Pacific area have been in dried condition. When dry, specimens of *Haliclona, Reniclona,* and related forms lose many of the distinctive characteristics which appear in life. Thus, specimens of this species may have been in collections and may have been given names; yet one would never be able to tell from the specimens that they were conspecific with the species here discussed. It must also be kept in mind that it may really be a unique endemic form, as here opined.

GENUS *TOXICLONA* new

This genus is here established in the family Haliclonidae to have as genotype the sponge described as *Siphonochalina gaussiana* by Hentschel, 1914, page 136. This species and this genus are characterized by haliclonid architecture, with a spiculation of oxeas and toxas.

No specimens of this new genus were found in the territory now under discussion. The species *gaussiana* was antarctic.

GENUS *RENIERA* Nardo

Haliclonid sponges occur that are ramose, with oscules scattered on the sides of the cylinders; this is true of the type species of the genus *Haliclona.*

Haliclonid sponges occur that are incrusting, with oscules scattered on the surface. Such are here treated as in the subgenus *Reniclona.* Around

their oscules there may be raised collars. When these collars are well developed, they come to resemble tubes.

Haliclonid sponges occur that are principally tubular, with oscules only at the summits of hollow cylinders. This form may be merely an exaggeration of the oscular collars of *Reniclona* sponges; if so, the name *Reniclona* may need to be replaced by *Reniera.* Such sponges, however, are here still regarded as of generic rank.

Reniera being ill known, Lendenfeld 1887, page 796, erected the genus *Phylosiphonia* for these tubular sponges. One might argue that this name should supplant Nardo's name, but it is here assumed, on the basis of Schmidt's discussions, that *Reniera* is available.

Reniera implexa (Schmidt) de Laubenfels

Text Figure No. 44

This species is here represented by the following:

U.S.N.M. No. 22981, My No. M. 358, collected July 5, 1949, by diver in the south corner of the lagoon at Ebon Atoll, in a miniature lagoon. The depth was 2 meters, and the substrate was dead coral.

There is a massive base, 3 cm thick and 5 cm in diameter, from which hollow cylinders rise 2 or 3 cm higher.

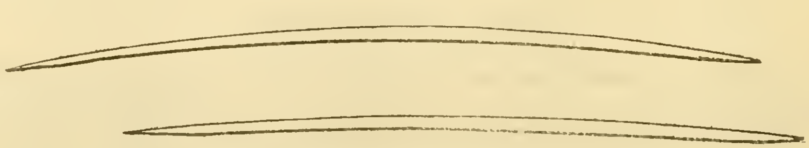
The color in life was lavender, with occasional patches of whitish drab. The latter were probably moribund. The endosome had the same color as the surface, and the consistency was very soft and fragile.

The surface is micropunctiform with skeletal pores 160 μ in diameter. Each such contains about seven actual pores which are 40 μ to 60 μ in diameter. These are separated from each other only by narrow strands of protoplasm about 10 μ to 20 μ wide. The oscules cannot be separated from the pores by visual observation.

There is no ectosome, and the endosome is an isodictyal reticulation.

The skeleton consists of oxeas, 2 μ by 130 μ to 3 μ by 120 μ in dimensions.

This species was first described by Schmidt from the Mediterranean region in 1868, page 27. Burton, 1930, page 515, records it from the Indian Ocean; and Wilson, 1925, page 398, from the Philippines. It is probably fairly common throughout the Old World but is not sharply separated from



Text Figure No. 44. Two of the spicules (oxea) of *Reniera implexa,* X 781.

other species of the genus *Reniera*. *Reniera* is separated from *Reniclona* by the tendency to rise high in tubular form. Undoubtedly, specimens growing in regions of strong currents would suffer a suppression of this tubular tendency and resemble *Reniclona*.

Reniera chrysa, new

Text Figure No. 45

This species is here represented by the following:

U.S.N.M. No. 22946, My No. M. 317, here designated as type, collected June 21, 1949, by diver at Ailing-lap-lap Atoll at the north side of the lagoon near Matien Islet. The depth was 5 meters and the substrate was dead coral.

This species consists of erect tubes reaching a height of at least 35 mm. They are 11 mm in diameter and had walls only 1 mm thick.

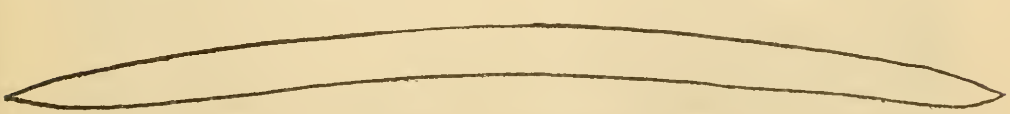
The color in life was vivid yellow, and the consistency weakly spongy. The surface is optically smooth but microscopically roughened.

Those openings, which seem to be pores, occur conspicuously, 60 μ to 100 μ in diameter and 200 μ apart, center to center. Yet these structures seem almost to penetrate the entire thickness of the walls, so that they are hardly typical pores. Because of the thin structure, it is difficult to differentiate between endosome and ectosome, but a fibro-reticulation is evident.

The skeleton consists of oxeas, 8 μ by 172 μ in dimensions, arranged in vague fibers with spongin. The largest fibers reach a total diameter of 400 μ.

The species *chrysa* is sharply cut off from nearly all others in *Reniera* by its bright golden color. Swarchewsky, 1906, page 330, described *Reniera hirsuta* from the Arctic. It is extremely close to *chrysa* in all items of description except for the fact that the latter is not at all hirsute, and the former is emphatically so. Furthermore, the color of *hirsuta* may have been otherwise in life; it was yellow after preservation in alcohol. Mention may be made of *Reniera pulcherrima* (Brøndsted, 1924, page 451) from New Zealand. Its color was inconspicuous, however, and its spicules much larger than those in *chrysa*.

The species' name is derived from a Greek word for "gold" and refers to the bright color of this sponge.



Text Figure No. 45. One of the spicules (oxea) of *Reniera chrysa,* X 781.

GENUS *NARA*, new

The genus is erected to be, at least temporarily, within the family Haliclonidae. Its skeleton is absolutely typical of the family, but the protoplasmic portions are so very different that some other family location may ultimately be necessary. This is a genus of dense, soft, jelly-like or colloidal protoplasm, permeated by a very diffuse, typical isodictyal reticulation of thin fibers. The spongin occurs chiefly at the nodes. The spicules are thin oxeas only. The genotype is the following species *Nara nematifera*. The generic name is derived from the Greek for "flowing," because of the soft consistency of this sort of sponge.

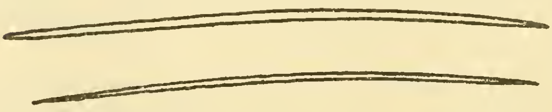
Nara nematifera, new

Text Figure No. 46

This species is here represented by the following:

U.S.N.M. No. 22980, My No. M. 357, here designated as type, collected July 5, 1949, by diver in the Pearl Pool in the western portion of the lagoon at Ebon Atoll. The depth was 3 meters, and the substrate was dead coral.

This species is abundant throughout the whole atolls of Ebon and Ailinglap-lap.



Text Figure No. 46. Two of the spicules (oxea) of *Nara nematifera*, X 781.

The shape is incrusting, about 1 mm thick, spreading laterally indefinitely, often covering ramose coral almost completely.

The exterior and interior color in life was a bright purple of a peculiar transparent or translucent nature. The specimens became green in alcohol. One of the most conspicuous field characteristics was the invariable presence of conspicuous pale parallel threads about 2 mm apart and indefinitely long, at least many cm in length, and about 50 μ to 150 μ in diameter. The consistency, as noted above, was softly colloidal.

The surface is shiny smooth, and no pores nor oscules can be made out.

There is no separate dermis or other ectosomal specialization. The endosome is a dense jelly, permeated by the above-mentioned strands, and contains definite flagellate chambers, 30 μ in diameter and spherical in shape. It is also permeated by an isodictyal reticulation.

The skeleton consists of very thin oxeas, 1 μ by 90 μ to 2 μ by 95 μ in dimensions. These are united at the ends in the above-mentioned reticulation

and occasionally are also encased in a thin film of spongin. Instead of triangular or square or diamond-shaped meshes, as is so often true in the genus *Haliclona,* the meshes in this case are often polygonal in outline and as much as 200 μ in diameter, so that the skeleton makes up only a small fraction of the mass of the organism.

This species was common at Ailing-lap-lap, but was not collected, because of the extreme extent to which it did not resemble a sponge. It was assumed to be a mass of mollusk eggs. It was again found commonly at Ebon, and just before leaving there I collected a bit, merely out of curiosity. Sections revealed the reticulation of spicules and the flagellate chambers.

Other species and genera of sponges contain similar mucoid material, but it is doubtful that any other possesses such large quantities. The pale threads constitute an even more unique and puzzling addition. Each specimen of this sort that I observed was full of them, and I did not find anything like them except in sponges of this sort. When put through histologic technique, they refused to take hematoxylin, but did stain vigorously with safranin, as though they were made of lignin. They show no trace of cellular or other organization and are comparatively solid and amorphous. They are certainly not ordinary spongin but might be chemically related to spongin. On the other hand, they do not look like spongin fibers and do not branch as spongin fibers regularly do but lie in undulating semi-parallel arrangement. Are they foreign inclusions or manufactured by the sponge? Are they a result of the copious slime production, or a cause of it?

The species name is from the Greek for "containing threads."

GENUS *CRIBROCHALINA* Schmidt

Cribrochalina olemda, new

Text Figure No. 47
Plate IV, Figure a

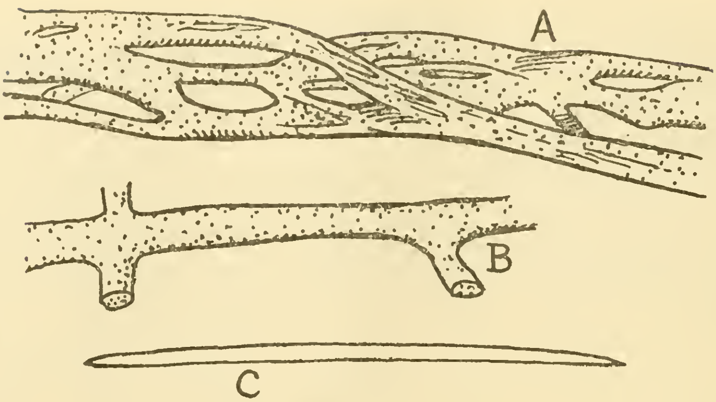
This species is here represented by the following:

U.S.N.M. No. 23115, My No. M. 497, here designated as type, collected September 2, 1949, by divers in Komebail lagoon, northwest of Koror in the Palaus. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 23077, My No. M. 459, collected August 13, 1949, by diver in the west portion of Truk lagoon, south of Pollé Islet. The depth was 4 meters, and the substrate was dead coral.

This species was uncommon at Truk, much more conspicuous in the Palaus.

The shape is tubular, little if any larger in diameter at the top than at the point of attachment. Occasionally two such tubes touch and anastomose. Very rarely one finds a specimen in which there is a branch. Such a branch is apt to be nearly at right angles to the original stem. The total diameter is



Text Figure No. 47. *Cribrochalina olemda. A:* Portion of one of the fascicular fibers, X 182. *B:* Portion of the network of simple fibers, X 182. *C:* One of the spicules (oxea), X 781.

commonly about 6 cm but may be as large as 16 cm. The height may reach as much as 40 cm, and specimens of over 30 cm are common. The walls of the tubes are usually about 5 to 10 mm thick, some were found as thin as 4 mm, and a few as thick as 20 mm.

The interior and exterior color in life was a pale, but clear and beautiful, blue. A few drab spots were probably pathological. The consistency was very spongy, and this species is peculiarly sticky to the touch. It excludes much slime, and this slime has a glue-like effect, being very difficult to wash from the hands.

The surface is tuberculate, with tubercles about 1 mm high and 3 mm apart on centers. When the sponge is dry, these shrink until they become conules. There are skeletal pores about 500 μ in diameter and about one for each 4 square mm of the surface. These in turn are subdivided into actual pores which are only 50 μ to 80 μ in diameter and are about 100 μ to 200 μ apart, center to center. The canal system of this sponge opens into the large cloaca, through holes or openings which should be called apopores; these are abundant, about 1 to 4 mm in diameter and 3 to 5 mm apart. It is fairly clear that all the inhalant apertures are on the exterior of the tube and that the exhalant ones lead on out through the cloaca.

The ectosome is somewhat unusual for one of the Haliclonidae, inasmuch as there are subdermal spaces. These are roofed over, however, by a dermis which is exclusively protoplasmic, containing no skeleton. The endosome is fibro-reticulate.

The skeleton comprises oxeas, 2 μ by 92 μ to 3 μ by 100 μ in dimensions. Most of these are located inside the fibers, which range from 12 μ to 25 μ in diameter and often intersect at approximately right angles. In addi-

tion, there are definite ascending fibers which come up to the tubercles or conules of the surface. These are fascicular, as though made out of many of the smaller fibers, but attain a total diameter of only some 100 μ.

This species is put in *Cribrochalina* with some misgivings, as that genus is ordinarily cup-shaped or funnel-shaped, with concentric lines on the interior. It is not very fruitful to search the literature for possible earlier descriptions of this species, because of the frequency with which older workers considered it sufficient to mention that a sponge was tubular or cup-shaped without giving such details, now known as important, as the surface structures and consistency. At the present time, at least five genera are characterized by just such external shape as that exhibited by *olemda.* This species may be described as being peculiar for the fascicular nature of the ascending fibers, for the fact that the cloacal rim does not flare outward, and for the peculiar and beautiful color.

The name which is here selected is the native (Palau) appellation for this particular species of sponge.

GENUS *XESTOSPONGIA* de Laubenfels

Xestospongia sapra, new

Text Figure No. 48

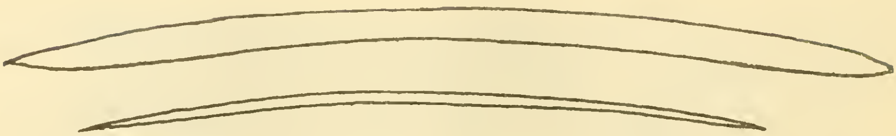
This species is here represented by the following:

U.S.N.M. No. 23074, My No. M. 454, here designated as type, collected August 10, 1949, by diver at the west side of Moen Islet in the Truk lagoon. The depth was less than 2 meters, and the substrate was dead coral.

U.S.N.M. No. 23020, My No. M. 318, collected June 21, 1949, by diver at the north side of the lagoon near Matien Islet at Ailing-lap-lap Atoll. The depth was 5 meters, and the substrate was coral, perhaps living or perhaps dead.

This species also is represented, although not in the present collection, by U.S.N.M. No. 22733 which was collected at Yap in the summer of 1946 by R. W. Hiatt.

This species appears to be moderately common throughout the whole Truk lagoon; other specimens were observed in Lemotol Bay in the western portion. This species was also collected in Yap, as noted above, and was described by de Laubenfels, 1949, page 126, on the basis of only a small specimen brought back by Professor Hiatt. In this reference, it was dubiously identified as *Xestospongia exigua,* which was first described as *Petrosia exigua* by Kirkpatrick, 1900, page 139, from the East Indian region. Comment was made as follows: "If it were better known, other differences might be revealed, demanding a different, perhaps new, name for the Yap species."



Text Figure No. 48. Two of the spicules (oxea) of *Xestospongia sapra*, X 781.

The shape of this species is massive. The specimens collected in Moen were about 6 cm high and 9 cm in diameter. The ones at Ailing-lap-lap were mostly somewhat smaller than this, but the one from Yap is described by Dr. Hiatt as being considerably larger, up to 30 cm in total length, although much of its mass was filled up with contained bivalve mollusks.

The color in life was blackish on the exterior but olive or olive-drab on the interior. The consistency was very soft, specimens falling apart of their own weight when taken out of water. When dry, they became very crumbly. Considerable slime was given off, and the first alcohol into which the specimen was put became somewhat like molasses in appearance and consistency.

The surface has a very distinctive finely conulose nature, about four conules for each square mm. These structures are so small that it might be better to describe the surface as rugose. As seen with the microscope, each of these tiny prominences is extremely irregular in shape. There are skeletal pores about 180 μ by 360 μ in size, filled with genuine pores 20 μ to 50 μ in diameter, often about 20 such to each skeletal pore. These genuine pores are not uniformly distributed, but are frequently grouped in bunches of two or three. The oscules are about 2 mm in diameter and 1 to 4 cm apart. There is no special ectosome, unless one considers that the concentration of black pigment near the surface might be so regarded. There is no sharp boundary, however, but a blending between the darker ectosome and the slightly paler endosome. The latter is confused in structure, with spicules packed around gross chambers, as characteristic of the genus *Xestospongia*. The round flagellate chambers are about 30 μ in diameter.

The skeleton consists principally of oxeas, often about 5 μ by 185 μ in dimensions. Some are as large as 6 μ by 150 μ, others as small as 2 μ by 120 μ. These smaller ones are so very numerous that it is questionable whether they constitute a separate category, or merely are juvenile forms.

It may be that *exigua* of Kirkpatrick actually is the closest relative of *sapra*, but *exigua* is described as being gray in color and definitely hard in consistency. Its spicules were considerably shorter, and there is added for it the strange statement that its ascending tracts were hollow.

The specific name *sapra* is derived from a Greek word for "rotten wood," as this amply describes both the texture and optical appearance of the sponge in question.

GENUS *NEOPETROSIA* de Laubenfels

Neopetrosia pandora, new

Text Figure No. 49

This species is here represented by the following:

U.S.N.M. No. 23046, My No. M. 425, here designated as type, collected August 1, 1949, by diver in East Ponapé (Matalanim) from a reef near an entrance to the lagoon. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 23072, My No. M. 452, collected August 10, 1949, by hand while wading at the west side of Moen Islet in Truk lagoon. The depth was less than 1 meter, and the substrate was dead coral.

U.S.N.M. No. 22907, My No. M. 212, collected August 13, 1949, by diver in Lemotol Bay in the west part of Truk lagoon. The depth was 4 meters, and the substrate was dead coral.

U.S.N.M. No. 22917, My No. M. 223, collected September 1, 1949, by divers in Iwayama Bay near Koror in the Palaus. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 23122, My No. M. 504, collected September 2, 1949, by divers, northwest of Koror, near Ngarebagal Isle in the Palaus. The depth was 3 meters, and the substrate was dead coral.

U.S.N.M. No. 23031, My No. M. 410, collected July 30, 1949, by diver in the lagoon in northwest Ponapé. The depth was 3 meters, and the substrate was dead coral.

U.S.N.M. No. 23024, My No. M. 403, collected July 30, 1949, by diver in northwest Ponapé, in the lagoon very near the outer reef. The depth was 5 meters, and the substrate was dead coral.

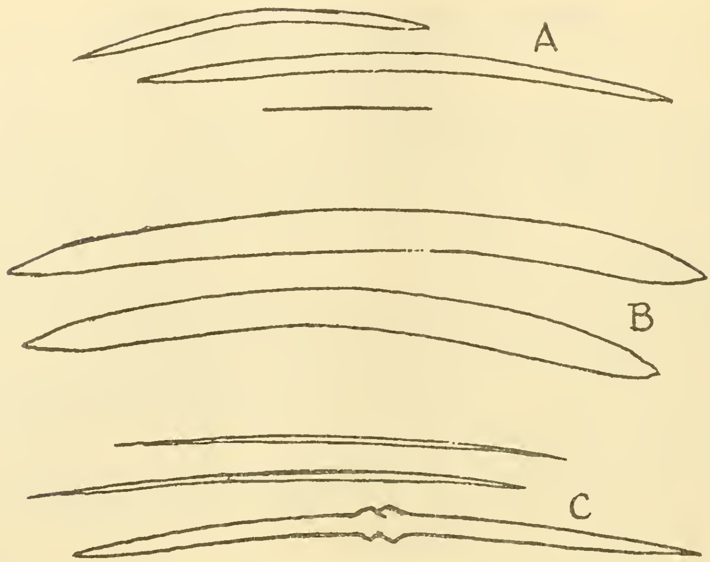
U.S.N.M. No. 22796, My No. N. 001, collected April 25, 1946 by J. P. E. Morrison at Bikini Atoll near the east end of the lagoon, 7 kilometers south of the west end of Bikini Islet. This was dredged from a depth of 50 meters; the substrate was not given.

This species, if indeed it be a single species, is extremely common in all the shallow water about Ponapé. It also is abundant in all the waters about Truk and is abundant in the various shallow waters of the Palau Archipelago. It is rare in the Marshalls.

The type specimen may first be described, and the others (which may possibly represent additional species) may then be compared.

The shape is repent, or sprawling ramose, reaching a maximum length of at least 13 cm. The diameter of the branches is often 9 mm.

The color in life as to exterior was dull olive drab, but about 500 μ below the surface there occurred a black subdermal layer 500 μ thick. Still deeper the endosome was very pale drab. The consistency was slightly spongy but also somewhat stiff, tearing very easily.



Text Figure No. 49. Spicules of *Neopetrosia pandora,* X 781. *A:* Three oxeas from specimen M. 425. *B:* Two oxeas from specimen M. 504. *C:* Three oxeas from specimen M. 410.

The surface is nearly smooth but is microscopically roughened. The pores are about 20 μ to 90 μ in diameter and 150 μ apart, center to center. Often the smaller ones are in groups of two or three, each such group probably representing a skeletal pore. The oscules are about 2 mm in diameter and 2 cm apart.

There is no ectosomal specialization, the surface being rather typical of the family Haliclonidae. The endosome is micro-cavernous, with spicules in some confusion outlining these chambers, but some of the spicules also are loosely organized into tracts. These are sufficiently vague that their diameters may be only approximately stated, but 100 μ to 400 μ may be mentioned.

Little or no spongin is present in the skeleton, and the very abundant spicules, which are all oxeas, vary from 0.5 μ by 35 μ to 2.5 μ by 95 μ.

Nearly every specimen of *pandora* collected appears to be a new species. The other one which is most like the type specimen, from Ponapé, is No. M. 212 from the western portion of Truk. Its spicules are slightly thicker, its color somewhat more greenish, and the organization of pores into groups is somewhat more marked. The second specimen from Truk, No. M. 452, is very similar to the type in most ways, but is much smaller, perhaps because it is juvenile. Its outstanding feature is the fact that its endosome, unlike all the others discussed for this species, is not pale drab but bright orange instead. Specimen No. M. 223 from Koror was very much like the type in practically every respect except one. This is extremely and conspicuously

different: the pores of this sponge from Koror are 500 μ in diameter and 1 to 2 mm apart. The other specimen here discussed from Koror (No. M. 504) is very much like the type, but its exterior was chocolate brown and its interior peach color. Its spicules were also different, many of them reaching the dimensions of 6 μ by 120 μ. Since the type specimen is from Ponapé, it is curious to note that others from that same island differed strikingly. No. M. 403 had the typical color of the interior, but its exterior colors were remarkable indeed. The upper surface was ochre yellow; the lateral surfaces were blue or violet, blending into each other; but the lower surface was pale drab like the interior. Of course, the dark subdermal layer was present. This specimen also differed markedly in spiculation; its megascleres were 8 μ by 460 μ. A third specimen from Ponapé differed in another respect, perhaps fully as strikingly. This one, No. M. 410, otherwise very much like the type, had spicules which were acanthose in about the middle sixth of their length. These spicules appeared at first to be centrotylote but, upon careful observation, the swelling proved to be a mass of spines aggregated closely together rather than a tylote swelling.

It would obviously be possible, perhaps advisable and correct, to regard these above described specimens as representing a minimum of six species. It seems clear that the specimens of the genus *Neopetrosia* urgently want further study. All those described are here put into the one species *pandora,* because of the fact that each one is much like the type specimen in all except one or two characteristics and because the most striking differences occurred, not as between those from different localities but amongst specimens growing almost side by side.

Certain characteristics seem to be consistent and dependable for all the specimens of that which is here regarded as the one species *pandora.* One may note especially the conspicuous subdermal black or blackish layer, about 500 μ below the surface and 500 μ thick. All these specimens have the same general appearance of surface and the same consistency and feeling to the fingers. The oscules are very similar. When carefully examined, many or all the oscules may be found to possess a sphincter, or rather a membrane, which may be pulled across them. In some cases this membrane closed as quickly as within five minutes after removal from the water.

In the West Indian region there is a species, *Neopetrosia longleyi* de Laubenfels, 1932, page 54, which is widespread and abundant. I have studied literally hundreds of specimens of it from various localities, and have used it for physiologic experimentation. It shows amazingly little variation; its specimens are monotonously similar. Its spicules are about 3 μ by 120 μ. Its color falls within the range of variation shown by *pandora,* but the two are not here regarded as conspecific.

Ridley and Dendy, 1886, page 327, described a sponge as *Petrosia similis* from the southern portion of the Indian Ocean. Wilson, 1925, page

406, recorded this or a similar species by the same name from the Philippines. This differs from *longleyi* and *pandora* by a rather peculiar dark blue color and particularly by the extremely large spicules, which are 16 μ by 225 μ. In other ways there are enough resemblances that it is here suggested that *similis* be transferred into the genus *Neopetrosia.*

FAMILY CALLYSPONGIIDAE de Laubenfels
GENUS *CALLYSPONGIA* Duchassaing & Michelotti
Callyspongia fistularis (Topsent) Burton

Text Figure No. 50

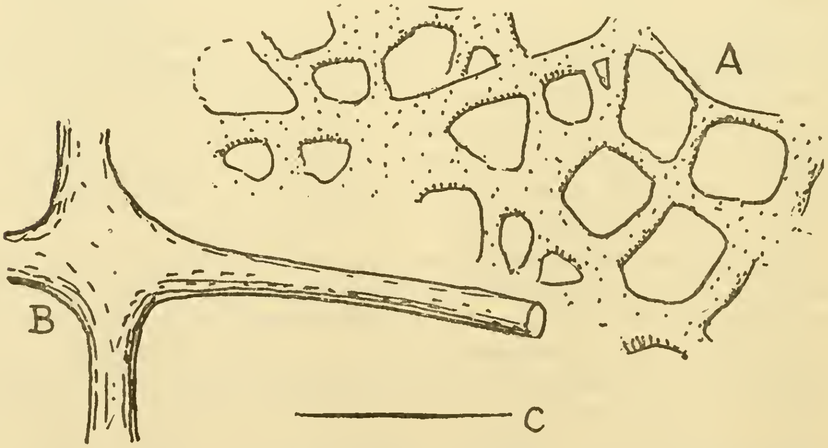
This species is here represented by the following:

U.S.N.M. No. 22964, My No. M. 338, collected June 29, 1949, by diver at Majuro Atoll in a miniature lagoon near the west end of the lagoon. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 22993, My No. M. 371, collected July 7, 1949, by diver at Ebon Atoll near the southeast side of the lagoon. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 22995, My No. M. 373, collected July 7, 1949, by diver in the open ocean at the west side of Ebon Atoll, near Rubé point. The depth was 3 meters, and the substrate was dead coral.

U.S.N.M. No. 22810, My No. N. 016, collected by W. R. Taylor by dredging in the lagoon of Eniwetok Atoll, 5 kilometers west of Jieroru Islet. The depth was 35 meters.



Text Figure No. 50. *Callyspongia fistularis. A:* Portion of the ectosomal reticulation, X 182. *B:* Portion of the endosomal reticulation, X 182. *C:* One of the spicules (oxea), X 781.

U.S.N.M. No. 22817, My No. N. 024, collected August 18, 1947, by F. M. Bayer and F. C. Zimmerman at Rongerik Atoll from the reef near Latobak Islet.

The shape is primarily incrusting, but specimen No. M. 373 also possessed a few repent solid branches. The thickness is about 8 to 10 mm and the diameter about 8 cm, but this depends upon environmental circumstances. There is probably indefinite lateral growth.

The color in life, where the specimen was obviously healthy, was a rather dull purple. This was true also of the endosome. The consistency was softly spongy.

The surface is punctiform, but the openings are covered with an obvious fine meshed net. The genus *Callyspongia* especially is distinguished by its peculiar surface. In this species, there is first of all a very neat reticulation of fibers about 60 μ in diameter, outlining meshes which are a little over 300 μ in diameter. These meshes are often square, or nearly square, in shape. Within these coarser meshes at the surface are finer ones which are outlined by fibers which are 15 μ to 20 μ in diameter. These smaller openings, frequently square or nearly so, are about 100 μ in diameter. These latter may be regarded as the pores of the sponge. In the species under discussion, exhalant openings are not conspicuous but do occur and vary from 1 to 6 mm in diameter. In some places there may be as few as only one or two to an incrustation, while in others they are abundant, sometimes in rows. Often each oscule is raised slightly, about 1 or 2 mm above the surrounding surface.

The ectosome is a peculiar double reticulation described above, the endosome is a much more commonplace and simple fibro-reticulation.

The skeleton consists almost entirely of clear spongin fibers as described. These are rather like the ones which are found in the genus *Spongia*, but here and there, these fibers of *Callyspongia* are cored with small spicules, all of which are oxeas. In the specimen from Majuro these were only about 0.3 μ by 38 μ. In the specimens from Ebon, they are a little larger, ranging from 2 μ by 80 μ to 2 μ by 93 μ.

Topsent, 1892, page 25, described a sponge as *Sclerochalina fistularis* from the Red Sea. Burton, 1937, page 21, described a sponge from the Indian Ocean and identified it with *fistularis* of Topsent but correctly referred it to the genus *Callyspongia.* The present specimens are identified with these of Topsent and Burton with some hesitation. The species *fistularis* was supposedly characterized by a peculiarly cartilaginous consistency, not present in these sponges from the western Pacific. But the spicules are about the same size; the surface, with the peculiar type of oscule, is very similar; and there are so many species already in *Callyspongia* that it seems inadvisable to add further numbers at the present time.

Callyspongia diffusa (Ridley) Burton

Text Figure No. 51
Plate IV, Figure b

This species is here represented by the following:

U.S.N.M. No. 23055, My No. M. 435, collected August 1, 1949, by hand while wading in eastern Ponapé (Matalanim) near the great ruins of Nan Matal. The depth was low tide mark, and the substrate was a combination of calcareous sand and the leaves of a monocot plant called "turtle grass."

U.S.N.M. No. 23058, My No. M. 438, collected at the same time and vicinity as the preceding specimen.

U.S.N.M. No. 23114, My No. M. 496, collected September 1, 1949, by divers in Iwayama Bay at Koror in the Palaus. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 23143, My No. M. 527, collected September 20, 1949, by diver in northwest Guam, northeast of Agana, at Dungas Beach. The depth was less than 2 meters, and the substrate was dead coral.

This species was common at Ponapé in the vicinity of Nan Matal and was one of the most nearly common of all the sponges of Guam.

The shape is sprawling ramose. Specimens commonly attain a length

Text Figure No. 51. *Callyspongia diffusa. A:* Portion of the ectosmal reticulation, X 182. *B:* One of the spicules (oxea), X 781.

of 15 cm or more, and some in Guam were over 40 cm. The diameter of the branches is 1 to 3 cm, but this varies greatly from place to place, as the structure is decidedly lumpy. The branches are often tangled, and frequently anastomose.

The color in life was very much the same as between endosome and ectosome, but had some very peculiar characteristics. It was basically a pale blue with many brown patches; or, in the case of those from Guam, it was rather a gray with orange patches. These patches blended into each other and were found both on the upper or brightly illuminated portions and on the lower more shaded portions. Many sponges show drab regions which are evidently the result of pathological or moribund conditions, but these brownish patches, in the species under discussion, appeared to be quite healthy. The consistency was spongy.

The surface varies from even to somewhat lumpy, and projecting fiber ends occasionally show. The pores may be described in terms of the surface net. Of this, the gross fibers are 40 μ to 100 μ in diameter. They outline meshes which are often nearly square and which are about 200 μ to 400 μ in diameter. Within them, outlining what may be regarded as the proper pores, are the smaller fibers which vary from only 5 μ to as much as 20 μ in diameter. These outline meshes, which are from 70 μ to 100 μ, rarely reach 180 μ in diameter. The oscules are 3 to 10 mm in diameter, the larger size being quite uncommon. They are often only 1 to 2 cm apart. In the specimen from Iwayama Bay, Koror, they had a tendency to be organized in rows.

The ectosome is the special dermal skeleton described above, and the endosome is a more simple fibro-reticulation with (as usual in this genus) a minimum of protoplasmic or soft parts.

The skeleton consists of fibers of rather typical spongin; these are cored with a few oxeas. These megascleres are usually 4 μ by 124 μ to 6 μ by 136 μ in dimensions; but, in Specimen No. M. 438, they were a little smaller, only 2 μ by 93 μ to 2.5 μ by 110 μ.

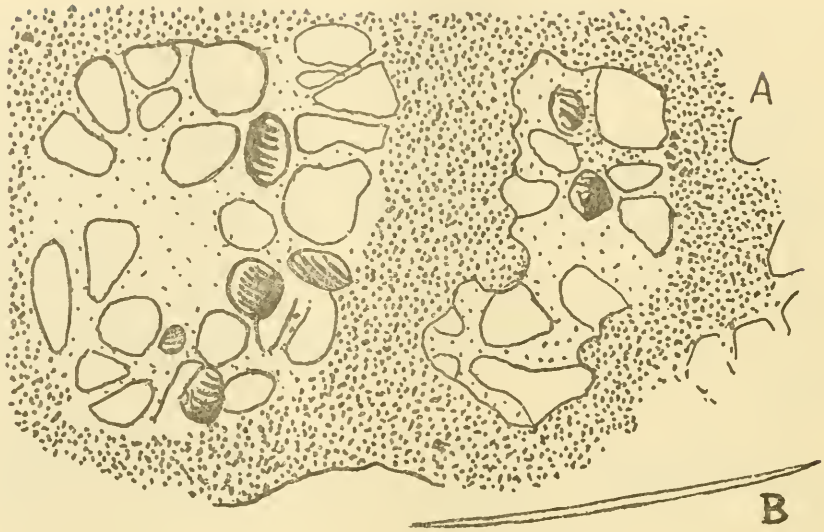
Ridley, 1884, page 183, described a sponge as *Cladochalina diffusa* from the Indian Ocean; Burton, 1934, page 541, properly transferred this to the genus *Callyspongia,* and extended its range throughout the East Indian region; de Laubenfels, 1950, page 12, records it from the Hawaiian Islands; and the present record would seem to indicate that it is spread extensively throughout the western Pacific as well.

Callyspongia psammophera, new

Text Figure No. 52

This species is here represented by the following:

U.S.N.M. No. 22831, My No. M. 107, here designated as type, collected June 20, 1949, by diver at Ailing-lap-lap Atoll in the channel beside



Text Figure No. 52. *Callyspongia psammophera. A:* Portion of the ectosomal reticulation, X 182. *B:* One of the spicules (oxea), X 781.

Bikájela Island. The depth was 10 meters, and the substrate was dead coral.

This sponge is amorphous to incrusting, reaching a thickness of about 8 mm and a diameter of 21 mm.

The color in life was almost white, but definitely a grayish lavender, changing rapidly to yellow in preservative. The consistency was between spongy and fragile.

The surface is punctiform. The coarser dermal skeleton consists of more or less square meshes, outlined by fibers about 90 μ in diameter. The mesh diameter is about 240 μ. These primary fibers are full of foreign material, which gives them such an irregular outline that they appear almost like walls between the gross pores. Each such skeletal pore is filled in with a finer mesh of fibers only about 10 μ in diameter, outlining true pores 50 μ in diameter, but these finer fibers also contain coarse material, the particles of which often are as much as 50 μ in diameter. The oscules are 2 to 4 mm in diameter, with a definitely raised rim. There is about one per each square cm.

The ectosome is as noted above, and the endosome is a fibro-reticulation.

The skeleton consists of spongin fibers of great irregularity in shape, but often about 100 μ in diameter. These contain coarse debris. There are also smaller fibers among them, only about 10 μ in diameter. The spicules are very rare and are oxeas 2 μ by 70 μ to 3 μ by 75 μ in dimensions.

This species is unique within the genus *Callyspongia* for its sand-filled fibers. The species name is obviously derived from the Greek word for sand-bearing.

FAMILY DESMACIDONIDAE, Gray
GENUS *GELLIODES* Ridley
Gelliodes gracilis Hentschel

Text Figure No. 53
Plate V, Figure b

This species is here represented by the following:

U.S.N.M. No. 23125, My No. M. 507, collected September 2, 1949, by diver northwest of Koror in the Palau Islands near Ngarebagal Island. The depth was 3 meters and the substrate was dead coral.

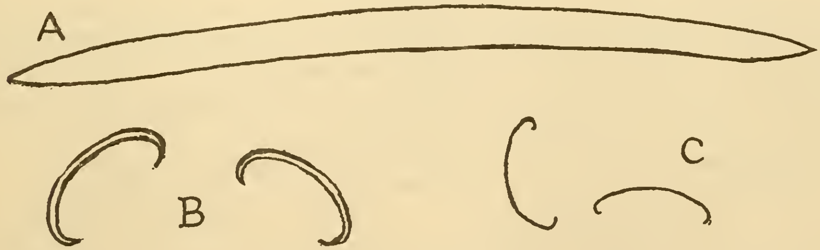
The species was quite common throughout most of the Palau Archipelago, as observed.

The shape is ramose and the branches end in very small prolongations, which may be incipient additional branches. The vertical measurement reached at least 14 cm, and the branches in transverse section are about 1 by 2 cm.

The ectosome and endosome color in life was a vivid lavender. The consistency was spongy but easily torn.

The surface is comparatively smooth, or punctiform, as a result of the very conspicuous pore areas. The latter are each about 1 mm in diameter and approximately 3 mm apart, center to center. Each contains a dozen or so actual pores, about 50 μ to 125 μ in diameter and 100 μ to 175 μ apart, center to center. The oscules are from 1 to 2 mm in diameter and 1 to 2 cm apart, occurring chiefly on the lateral surfaces of the branches, not apical or terminal.

The ectosome is not conspicuous, but with a microscope it is possible to discover an extremely thin dermis, about 4 μ thick, which occurs as a ceiling to small ramifying subdermal cavities. This ectosome contains no spicules or other skeletal structures. The endosome is a neat fibro-reticulation.



Text Figure No. 53. Spicules of *Gelliodes gracilis*, X 781. *A:* Oxea. *B:* Larger sigmas. *C:* Smaller sigmas.

The skeleton consists of clear spongin fibers, about 30 μ in diameter, making very regular meshes which are often square and about 100 μ in diameter. The megascleres are very often situated in the middle of these fibers and usually are as few as one spicule per cross section. These are oxeas 6 μ by 140 μ in dimensions. In addition to them, there are numerous microscleres present. These are sigmas of two thicknesses, from about 20 μ to 25 μ in chord length, in all cases. The thinner ones are only a minute fraction of a micron thick, but the other category has a thickness of about 2 μ.

Hentschel in 1912, page 395, described *Gelliodes gracilis* from the East Indian region. His specimens had very numerous oscules, and there is not enough data to know if they corresponded in color to this specimen from the Palaus, but the resemblance is close enough that one is reluctant to create a new species name.

There is a very serious question as to whether *gracilis* belongs in the genus *Gelliodes.* It answers to the usual diagnosis of that genus, in that it is a fibrous sponge with oxeas and sigmas, but the dermal structures and general over-all appearance are extremely different from the genotype of *Gelliodes.* On the other hand, there is no other genus which fits better, and the only alternative would be to erect a new genus. This is not deemed advisable at the present time. The contrast, however, is brought out in Plate 5, Figure a.

Gelliodes callista, new

Text Figure No. 54
Plate V, Figure c

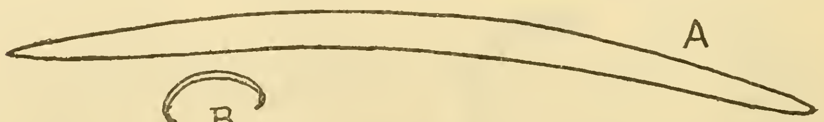
This species is here represented by the following:

U.S.N.M. No. 23131, My No. M. 514, here designated as type, collected September 6, 1949, by using a fish spear, in Iwayama Bay near Ulebsechel Island in the Palaus. The depth was less than 2 meters, and the substrate was dead coral. This species was not common.

The shape is sprawling ramose, with branches 3 to 4 cm in diameter and a long measurement of at least 21 cm. The colony attained a lateral measurement of at least 21 cm.

The color in life was a beautiful pinkish orange, often described as peach color. The endosome possessed this shade to an even more intense degree than did the ectosome. The consistency was spongy.

The surface is conulose, with conules 3 or 4 mm high and 5 or 6 mm



Text Figure No. 54. Spicules of *Gelliodes callista,* X 781. *A:* Oxea. *B:* Sigma.

apart. In many regions the so-called conules are so broad at the base that the term undulating is more applicable than conulose. The pores are about 0.3 mm in diameter, and there is one for about each square mm. The oscules are 4 to 7 mm in diameter and are about 3 to 6 cm apart. Each immediately branches into several large canals, which are conspicuous.

The ectosome is an obvious tangental spicular reticulation, reminiscent of the dermal skeleton of *Callyspongia* but less well provided with secondary spongin fibers.

The ectosome is little more than a continuation of the endosome, but in it a conspicuous fibro-reticulation shows, the fibers being simply those of the whole sponge. It is noteworthy that in between these are meshes reminiscent of those which characterize the genus *Callyspongia.* The endosome is fibro-reticulate.

The skeleton consists of fibers which are rather crowded with spicules but do definitely contain spongin. These vary from about 40 μ to 140 μ in diameter, and they outline meshes which are often triangular but sometimes polygonal. As noted above, these may be walled in with a sieve-like pattern that is more or less isodictyal. The megascleres are oxeas, somewhat hastate, 6 μ by 140 μ in dimensions. The microscleres are sigmas, 16 μ in chord length.

This species bears considerable resemblance to the genotype of *Gelliodes,* which was originally described as *Axos fibulata* by Carter, 1881, page 383, and transferred into this genus by Ridley, 1884, page 426. *Fibulata* is an Australian species. The color in life is not known, and the spicules are about twice as long as those of *callista.* Its pores and oscules are not described by Carter. Were more data about it to become known, more resemblance between it and *callista* might be revealed, but on the other hand more differences might appear instead.

The new species name is derived from the Greek word meaning "beautiful."

GENUS *IOTROCHOTA* Ridley

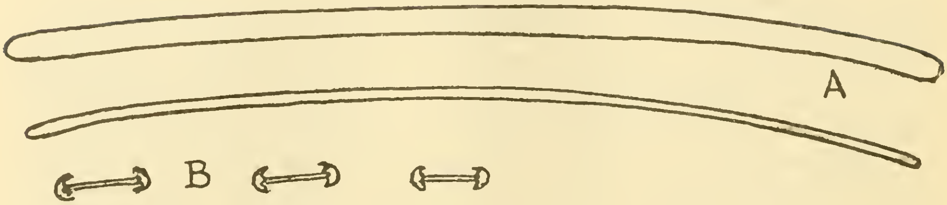
Iotrochota pella, new

Text Figure No. 55

This species is here represented by the following:

U.S.N.M. No. 22958, My No. M. 332, here designated as type, collected June 28, 1949, by diver at Majuro Atoll in the east end of the lagoon, near Rita (or Jarej) Islet. The depth was 4 meters, and the substrate was dead coral.

U.S.N.M. No. 22967, My No. M. 341, collected July 2, 1949, by diver at Majuro Atoll near the south side of the lagoon near Rairok Islet. The depth was 2 meters, and the substrate was dead coral.



Text Figure No. 55. Spicules of *Iotrochota pella,* X 781. *A:* Strongyles. *B:* Amphidiscs.

This species was abundant at Majuro Atoll, especially toward the eastern portion of the lagoon.

This species is incrusting, but it is very difficult to give its measurement. The thickness is complicated by the fact that it is usually on ramose coral, whose surface is both deeply eroded and in other places strongly protruding. Certainly bits as thick as 6 cm can be found in a few places. The lateral growth is indefinite, limited only by the size of the dead coral on which it is placed. Many specimens often amount to as much as 40 square cm.

In life, the color of the exterior was intense glistening black. The interior was very dark dull green, but the green color may have been due to symbionts rather than to the sponge itself. The consistency was spongy.

The surface is conulose, but the conules vary greatly in size; an average measurement may be stated as 1 mm high and 2 mm apart. The pores are about 35 μ to 50 μ in diameter and about 100 μ apart, center to center. The oscules could not be distinguished from the inhalant apertures.

The ectosome consists of a thin fleshy dermis, and the endosome is also very fleshy. It contains an irregular fibro-reticulation, but this is far from conspicuous.

The skeleton consists of roughened irregular fibers, about 15 μ to 60 μ in diameter. Most of their extreme irregularity arises from the fact that they are full of foreign debris. Some of the ascending fibers may even be fascicular in nature. These fibers also contain proper megascleres, about 10 per cross section. These spicules are strongyles, often extremely straight, but in other cases, definitely curved; some are 4 μ by 140 μ, others 3 μ by 180 μ, some 2 μ by 200 μ, and others measure within these ranges. The microscleres are very rare, but are very symmetrical amphidiscs, or birotulates, 17 μ long, with the discs 4 μ in diameter. The number of teeth is difficult to make out because of refraction patterns, but there appear to be about 6 at each end.

This species is distinctive for the extreme thinness of its spicules and the abundance of foreign material, together with the resulting extreme irregularity of the fibers. The color is probably also distinctive. Many specimens of *Iotrochota* are mentioned in the literature as being black, but these

are dried or preserved specimens; the purple *Iotrochota* tends to become black upon dying.

The inclusion of *Iotrochota* in the Desmacidonidae follows a custom that may need to be changed. Revision of the orders is not to be undertaken in the present paper. It will be a monumental task, but it is here suggested that when finished it may prove to be that *Iotrochota* will have been put together with *Hiattrochota* in the Hymeniacidonidae. The same comment will apply to the ensuing species, which is also left in the Desmacidonidae only on sufferance, with the suspicion that it may later be transferred to some other family, perhaps also the Hymeniacidonidae.

The name is derived from the Greek word for "dark," referring to the color of this sponge.

GENUS *OXYMYCALE* Hentschel

Oxymycale stecarmia, new

Text Figure No. 56

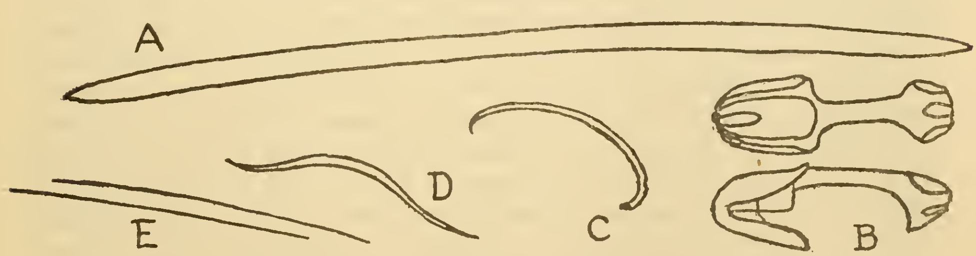
This species is here represented by the following:

U.S.N.M. No. 22890, My No. M. 190, here designated as type, collected August 3, 1949, by diver in southwest Ponapé, that is to say in Kiti, near Toletik Islet. This was from a reef in the lagoon near the shore. The depth was 4 meters, and the substrate was dead coral.

The shape is semi-incrusting, the thickness about 1 cm, and the diameters 2 by 4 cm.

The color in life was gray-drab, both as to exterior and interior. The consistency was soft, but sticky to the touch.

The surface is microscopically velvet-like, rather smooth. The pores were so completely closed that they cannot be made out, and their diameter in life cannot be stated confidently, but there are about two of them for each square mm. They were probably in the neighborhood of 100 μ in diameter. The oscules are dubiously represented by a few holes, 2 mm in diameter, which look as though they might be fortuitous.



Text Figure No. 56. Spicules of *Oxymycale stecarmia*, X 781. *A:* Oxea. *B:* Palmate anisochelas, front and (below) side view. *C:* Sigma. *D:* Toxa. *E:* Raphides.

There is little or no ectosome, and the endosome is a confused mass.

The skeleton consists of megascleres and microscleres. The former are oxeas 4 μ by 154 μ in dimensions. The latter include conspicuous and numerous palmate anisochelas, 42 μ long. There are a number of other microscleres present, but some are obviously foreign. The thin raphides, 90 μ long, and some sigmas, 32 μ in chord length, may be proper. One or two toxas, 46 μ long, were observed, but these were almost certainly foreign.

This species is very distinctive for the small size of its megascleres. In other species of the genus, they are usually three or four times as thick and five or six times as long.

The species name selected calls attention to the resemblance to the genus *Carmia,* rather than to other species already in *Oxymycale.*

Oxymycale strongylophora, new

Text Figure No. 57

This species is here represented by the following:

U.S.N.M. No. 22937, My No. M. 307, here designated as type, collected June 20, 1949, by diver at Ailing-lap-lap Atoll in the channel beside Bikájela Island. The depth was 10 meters, and the substrate was dead coral.

The shape is amorphous, obviously extremely cavernous. The vertical measurement is 2 cm and the diameter 5 cm.

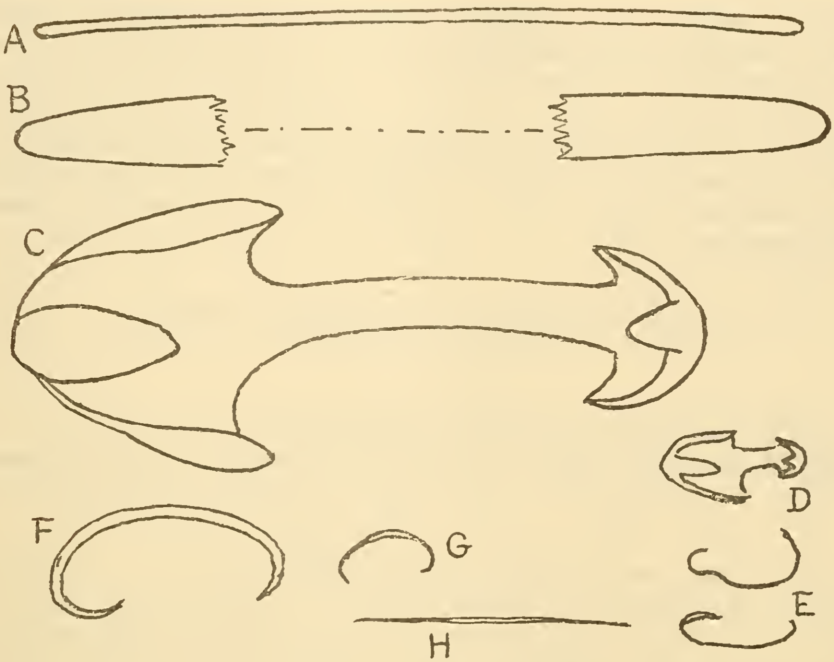
The exterior and interior color in life was red-orange to orange-red. It has kept the color astonishingly well during preservation in alcohol; red colors very often dissolve out into the spirits. The consistency was slightly spongy but fragile, breaking easily.

The surface is undulatory, the pores promptly close, and the oscules do not show.

The ectosome is characterized by a fairly large amount of spicule, but scarcely enough to be called a special spicule dermal skeleton. The endosome is extremely cavernous, permeated by spicular tracts.

The skeleton consists of little or no spongin but numerous megascleres in tracts of such size that per each cross-section there are about 16 spicules. These are strongyles 11 μ by 570 μ. The microscleres are numerous and conspicuous. There are huge palmate anisochelas with the palmate structure so ill developed that they are almost arcuate; these are 120 μ long. Others of more typical shape are 25 μ long, and those of still a third category are only 15 μ long. There are huge sigmas, 120 μ in chord length, another category 35 μ, and a smaller category 20 μ in chord length. There are also very fine raphides, arranged in trichodragmas. These are about 50 μ long.

By definition this species obviously belongs in the family Desmacidonidae, but its closest relatives are obviously not in that family, but instead with



Text Figure No. 57. Spicules of *Oxymycale strongylophora*. *A:* Strongyle, X 182. *B:* The two ends of one of the strongyles, midportion not shown. *C:* Larger anisochela. *D:* Smaller anisochela. *E:* Yet smaller, exceedingly thin as isochelas. *F:* Larger sigma. *G:* Smaller sigma. *H:* Raphide. *B-H:* X 781.

Mycale in the family Ophlitaspongiidae. Within the genus *Mycale* there are two groups which have similar skeletal characteristics, but are very distinct from each other in that one has very fine-grained, dense structure whereas the other is exceedingly coarse and cavernous (see de Laubenfels, 1926, page 570). The present species, *strongylophora,* is like the latter sort of *Mycale.* The point here emphasized is that we may have two groups of sponges exceedingly similar in spiculation but very different as to protoplasm. Contrariwise, we may have two that are very similar as to protoplasm, but very different as to spicules. This brings about very great problems in systematization. Were this species now under consideration to be placed within the family Ophlitaspongiidae, one might just as well put many of the rest of those genera and species, which are now in Desmacidonidae, also in the same family Ophlitaspongiidae. The results would be chaotic. It is the present opinion of the writer that the course of action most in harmony with nature would be to reshuffle the Poecilosclerina completely into families bearing no relationship at all to the present ones but, instead, emphasizing protoplasmic structures. Thus, the sponges now in the genus *Mycale* might find themselves in two

different families. The action here recommended is almost or quite impossible to carry out at the present time, if ever, for the simple reason that the vast majority of descriptions of sponges do not give data on the facts here considered important. This is not to any great extent due to carelessness on the part of the authors but is principally the result of the great difficulty in adequately describing protoplasmic structures, even with freshly collected specimens. It is, of course, far more difficult with specimens which have been long preserved.

GENUS *PROTOPHLITASPONGIA* Burton

Protophlitaspongia ada, new

Text Figure No. 58

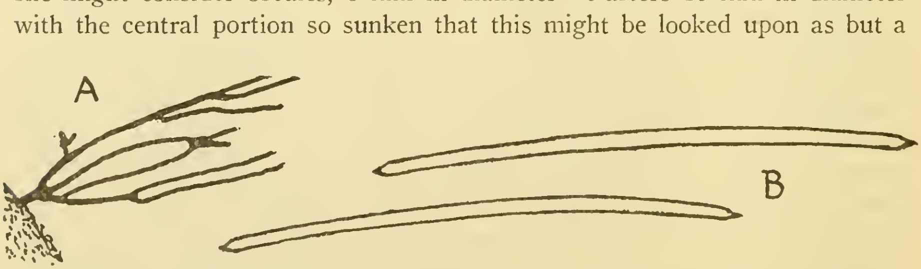
This species is here represented by the following:

U.S.N.M. No. 23026, My No. M. 405, here designated as type, collected July 30, 1949, by diver in northwest Ponapé between the reef and the shore. The depth was 5 meters, and the substrate was dead coral.

The shape is ramose, with very many anastomoses between the branches. The latter are about 15 mm in diameter and very commonly attain a height of 14 cm. The mass is often as large as 11 cm in diameter. This species is rather common about Ponapé, and some specimens were observed to be as much as 50 cm high.

The endosome and ectosome color in life was gray and the consistency was spongy but afforded a very distinctive sensation to the fingertips, as though one were rubbing sandpaper. A great deal of slime also was extruded promptly upon handling.

The surface is multiple conulose, the vague primary conules being in turn secondarily tuberculate. Much of this roughness is due to the presence of sand in the ectosome. The pores were closed in all specimens studied, and many showed no oscules. On the other hand, many of the larger ones had a very distinctive type of exhalant opening. There would be clusters of what one might consider oscules, 6 mm in diameter—clusters 15 mm in diameter with the central portion so sunken that this might be looked upon as but a



Text Figure No. 58. *Protophlitaspongia ada. A:* Sketch of the entire sponge, X ⅓; this is NOT a camera lucida drawing. *B:* Two of the spicules (hastate oxeas or "tornotes"), X 781.

single oscule which immediately branched into five or six divergent descending or ascending canals. In a dried specimen, the pores again are in evidence; they are 300 μ in diameter when affected by drying, and appear to be as common as one μ per each square mm.

As noted above, the ectosome contains considerable foreign material and otherwise is extremely irregular. The endosome is a fibro-reticulation. The skeleton consists of fibers about 120 μ in diameter, with a central third, 40 μ in diameter, profusely cored with spicules. The meshes are rounded and extremely irregular in size, some as small as 80 μ by 150 μ and others as much as 1 mm or more in diameter. The spicules are oxeas, 2.5 μ in diameter and about 87 μ to 95 μ long. The ends show some tendency to be hastate.

The species *ada* is unique within the small genus *Protophlitaspongia* for its very small spicules and for the presence of sand in the dermal region.

The species' name is selected for brevity, because the genus name is long. It has no special translation or significance.

Protophlitaspongia aga, new

Text Figure No. 59

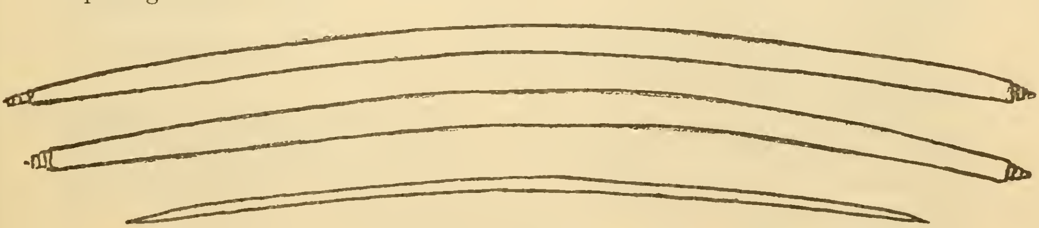
This species is here represented by the following:

U.S.N.M. No. 23124, My No. M. 506, here designated as type, collected September 2, 1949, by diver near Ngarebagal Islet northwest of Koror in the Palau Islands. The depth was 3 meters, and the substrate was dead coral.

The shape is ramose with projections. The branches are about 2 cm in diameter, and the vertical measurement at least 21 cm.

The ectosome and endosome color in life was blue, verging on lavender. The consistency was sticky and slimy, very much like *Protophlitaspongia ada.*

The surface is profusely covered with holes and projecting fibers. The latter often protrude as much as 3 or 4 mm. The pores are of all sizes, from some which are minute, even under the microscope, to others of 2 or 3 mm. The latter are probably oscules, but it is not possible to draw a sharp line between inhalant and exhalant aperatures or even to be sure that all the openings led to canals.



Text Figure No. 59. Three of the spicules of *Protophlitaspongia aga,* X 781.

The ectosome, as noted above, is a confused jumble. The interior is a fibro-reticulation but also is so confused that it is not practical to give mesh sizes.

The skeleton contains spongin, to judge from its flexibility, but this is not conspicuous in sections. The principal skeletal structures are the spicules, which are diactinal and 5 μ by 175 μ to 5 μ by 180 μ in dimensions. The ends appear hastate but, on the other hand, show a progressively graded series of steps so that they may be malformed strongyles. A number of thinner spicules may be juvenile forms.

The species *aga* is more like the two species which hitherto have been placed in this genus than was *ada*. The type of the genus was first described as *Siphonochalina bispiculata* by Dendy, 1895, page 246. Burton, 1934, page 562, established it as type of *Protophlitaspongia* and, at the same time, added a new second species, *oxeata*. Both of these are from Australia. The first, that is to say *bispiculata*, has megascleres about the same diameter as those in *aga* but some very much shorter, and its structure, being lamellate, is very different. The second, or *oxeata*, is closer to *aga* but is described as brown in color and as having a very different appearing surface.

The species name is selected for brevity, because the genus name is long. It has no especial translation or significance.

ORDER POECILOSCLERINA, Topsent (or POECILOSCLERIDA*)

FAMILY ADOCIIDAE de Laubenfels
GENUS *PELLINA* Schmidt
Pellina eusiphonia Ridley

Text Figure No. 60

This species is here represented by the following:

U.S.N.M. No. 22983, My No. M. 360, collected July 5, 1949, by diver in the Pearl Pool at the western portion of the lagoon at Ebon Atoll. The depth was 5 meters, and the substrate was dead coral.

The sponge has the shape of hollow cylinders with walls less than 1 mm thick and often only 250 μ thick. The diameter of the tube is about 3 mm, more or less, and the length is often 10 cm.

The color in life was pale grayish purple to pink, and the consistency was weakly spongy.

To the naked eye, the surface is even, but microscopically a few spicules project at right angles here and there. The pores are 80 μ in diameter and are crowded very closely together. The oscules cannot be seen, or they may be represented by the distal terminations of the tubes.

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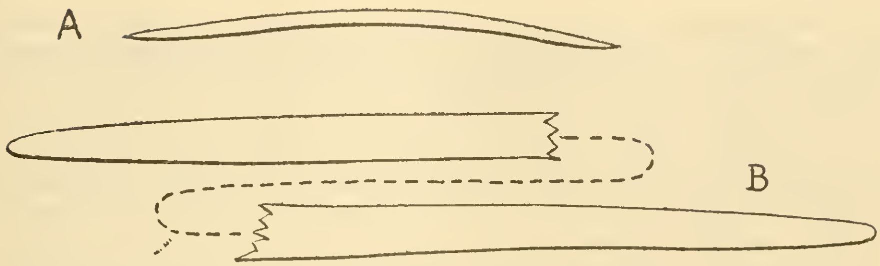
* See footnote on page 4.



Text Figure No. 60. Spicules of *Pellina eusiphonia*. *A:* Oxea of commonplace shape, X 182. *B:* Two ends of a partially strongylote spicule, X 781; the central portion is not shown.

The ectosome is a tangental reticulation of isodictyal nature. The endosome is little more than a minute layer of flagellate chambers but does contain some additional isodictyal reticulation and some spicules in confusion.

The skeleton consists entirely of oxeas, which sometimes have a slightly strongylote or rounded termination at both ends. Most of them are about 10 μ by 370 μ, but a few are as small as only 2 μ by 110 μ.

Ridley, 1884, page 414, described *Pellina eusiphonia* from the East Indian region. It may be that there are some specific differences between it and this specimen from Ebon, but Ridley's description does not make such clear. Therefore, the identification is here made with *eusiphonia.*

Pellina pinella, new

Text Figure No. 61

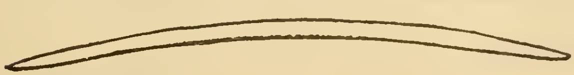
This species is here represented by the following:

U.S.N.M. No. 22853, My No. M. 147, here designated as type, collected July 5, 1949, by diver in a miniature lagoon at Ebon Atoll near the south corner of the lagoon. The depth was 2 meters, and the substrate was dead coral.

This species consists of hollow erect cylinders with walls only about 50 μ thick. The diameter of the tubes is about 3 mm, and the vertical measurement at least 11 mm.

The color in life was white, and the consistency was fragile.

The surface is comparatively level, although the meshes of the skeleton cause it to appear micropunctiform. The pores are about 70 μ in diameter and 140 μ apart, center to center. The oscule is represented only by the distal termination of the tube.



Text Figure No. 61. One of the spicules (oxea) of *Pellina pinella,* X 781.

The sponge is so thin that no distinction can be made between ectosome and endosome. There is but the single layer of fibro-reticulation, whose meshes are filled in with thin protoplasm; and the pores (if they may so be called) penetrate quite through this layer.

The skeleton consists of fibers about 50 μ in diameter, outlining meshes which vary from 100 μ to 400 μ in diameter and are frequently triangular or rounded. There are also fairly numerous spicules in these fibers, which are oxeas 3 μ by 98 μ in dimensions.

Other than the following species, the species *pinella* is unique within the genus *Pellina* because of the very small size of its spicules. Row, 1911, page 316, described a sponge as *Renicra tabernacula* from the Red Sea region; and Burton, 1926, page 74, transferred it to *Pellina.* This sponge has similar small spicules, but it is far from certain that it really belongs in the genus *Pellina.* Row had only a small fragment for description, and it is suggested here that it is essentially unrecognizable.

Pellina carbonilla, new

Text Figure No. 62

This species is here represented by the following:

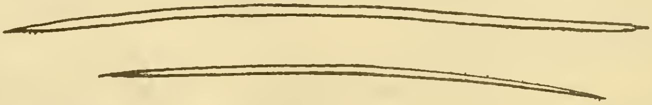
U.S.N.M. No. 22972, My No. M. 348, here described as type, collected July 5, 1949, by hand while wading in the Pearl Pool near the western portion of the lagoon at Ebon Atoll. The depth was low tide mark, and the substrate was dead coral. This species was quite common in this region.

This species is basically incrusting, but numerous processes rise from the basal mass to a height of at least 4 cm. Lateral growth is indefinite, but most specimens were about 4 cm in diameter. The processes, being obviously oscular, are hollow with very thin walls.

The ectosome and endosome color in life was black, and the consistency weakly spongy.

The surface is finely tuberculate; but pore diameters could not be made out, as they are closed in the specimens soon after collection. The oscules are about 3 or 4 mm in diameter and are represented by the apices of the processes. A few are as much as 8 mm in diameter. The oscules are very numerous over the entire sponge.

The ectosome consists of a tangental layer of spicules arranged in iso-



Text Figure No. 62. Two of the spicules (oxea) of *Pellina carbonilla,* X 781.

dictyal reticulation. The endosome also is isodictyal and contains very numerous round flagellate chambers 40 μ in diameter.

The skeleton consists of oxeas, 1.5 μ by 93 μ to 2.5 μ by 112 μ. It might be said that in general they were about 2 μ by 100 μ.

This, like the preceding species, is sharply set off from others in the genus *Pellina* by the very small size of its spicules. Since the preceding species came from the same part of the world, it might be expected that they would be closely related to each other; but, far from this being the case, it is suggested here that they may even deserve separate genera. The two preceding species, *eusiphonia* and *pinella,* belong in a group of the genus *Pellina* which is well characterized by that species first described as *Eumastia sitiens* by Schmidt, 1870, page 42. Sponges in this group are little more than tubular processes with scarcely any basal mass at all. They are usually pale in color and very fragile. The species *carbonilla* belongs instead in a subdivision of the genus *Pellina* which is well characterized by the sponge first described as *Spongia carbonaria* by Lamarck, 1814, page 375. Sponges in this group have a very considerable basal mass; the walls of the ascending processes are relatively thick; and the color is regularly dark and commonly black. The type of the genus is in the first of these two subdivisions. Therefore, if a new genus were to be established, it should be one receiving *Pellina carbonaria* as type.

The specific name represents a diminutive of *carbonaria,* because the sponge is like the following species, but with minute spicules.

Pellina carbonaria (Lamarck) de Laubenfels

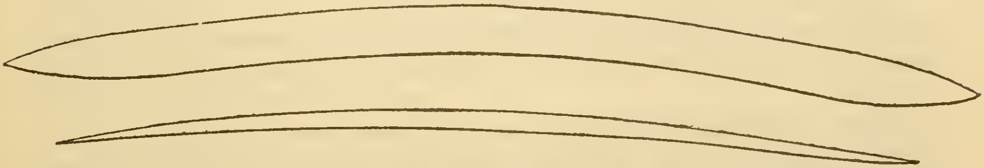
Text Figure No. 63

This species is here represented by the following:

U.S.N.M. No. 23113, My No. M. 495, collected September 1, 1949, by divers in Iwayama Bay, Koror, in the Palau Islands. The depth was 2 meters, and the substrate was dead coral.

The shape is sprawling, with chimneys rising up to 4 cm high. These tubular processes are about 8 mm in diameter and have walls less than 1 mm thick.

The exterior and interior color in life was black, and the consistency fragile.



Text Figure No. 63. Two of the spicules (oxea) of *Pellina carbonaria,* X 781.

The surface is smooth, with abundant small but very contractile pores. The oscules are represented by the hollow terminations of the ascending processes and are, therefore, some 6 mm in diameter and about 2 or 3 cm apart.

The ectosome consists of a tangental isodictyal reticulation, and the endosome is also permeated by an isodictyal reticulation.

The skeleton consists of oxeas, often about 12.5 μ by 250 μ, but occasionally as small as 5 μ by 225 μ in dimensions. The latter are probably juvenile.

Lamarck, 1814, page 375, described *Spongia carbonaria,* stating that it was from the West Indian region, but his specimens conform very closely to the present ones from the Palaus. De Laubenfels, 1936, page 68, transferred *carbonaria* to *Pellina,* and recorded it from the West Indian region, but although it was from the supposed type locality, discovered the spicules to be much smaller than those recorded by Lamarck, and found them to be often strongylote rather than typical oxeas. If Lamarck made a mistake in the locality from which the specimens came, as is quite possible, one would conclude that these from the Palaus represent typical *carbonaria,* and those from the West Indies deserve a new specific name. In this case the species would not be world wide. If Lamarck is correct in his statement as to locality, then this may be regarded as a circumequatorial species.

Pellina pulvilla (Thiele) de Laubenfels

Text Figure No. 64

This species is here represented by the following:

U.S.N.M. No. 23145, My No. M. 529, collected September 20, 1949, by diver on the northwest shore of Guam in Dungas Bay near Agana. The depth was 1 meter, and the substrate was dead coral.

The shape is ramose, the branches being tubes about 7 mm in diameter with walls 1 mm thick. A vertical dimension of at least 5 cm is reached. It is noteworthy that many of these processes anastomose; this is not common within the genus *Pellina.*

The ectosome color in life was nearly black, but the endosome was quite pale. The consistency was very soft.

The surface is even but conspicuously provided with pores, about 100 μ by 130 μ in dimensions and about 700 μ apart, center to center. The oscules range from 2 to 5 mm in diameter and are located at the ends of the processes.

The ectosome is not detachable but is a tangental reticulation of spicules. The fact that it does not easily come loose makes it seem a little dubious that this is a *Pellina.* The endosome is quite noteworthy because the flagellate

Text Figure No. 64. Three of the spicules (oxea) of *Pellina pulvilla*, X 781.

chambers, which are round and 25 μ to 35 μ in diameter, are rendered especially conspicuous by the darkly pigmented cells which surround them.

The skeleton contains no fibers but only oxeas in isodictyal reticulation. These are usually 4 μ by 120 μ to 5 μ by 100 μ in dimensions, but a few are as small as 1.5 μ by 100 μ.

Thiele, 1903, page 939, described *Protoschmidtia pulvillus* from the East Indies. It is transferred here to the genus *Pellina*. This species from Guam quite possibly deserves a new name. Thiele's brief description gives no basis for separation, but he mentions nothing of the peculiar endosome structure. Were *pulvillus* better known, it might prove to be significantly different in this and other respects.

GENUS *ADOCIA* Gray

Adocia viola, new

Text Figure No. 65

This species is here represented as follows:

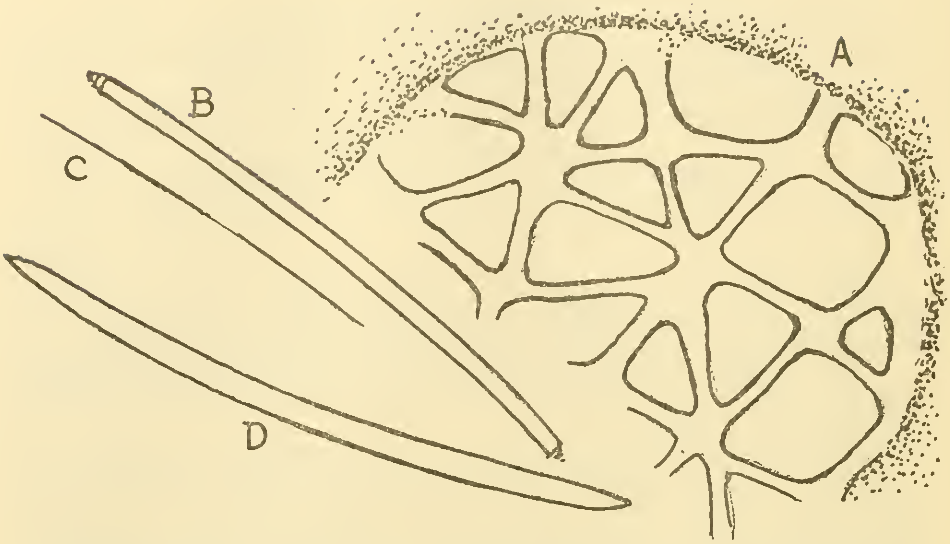
U.S.N.M. No. 23142, My No. M. 526, here designated as type, collected September 20, 1949, by diver in northwest Guam northeast of Agana at Dungas Beach. The depth was less than 2 meters, and the substrate was dead coral.

U.S.N.M. No. 23042, My No. M. 421, collected August 1, 1949, by diver in eastern Ponapé (Matalanim) from a reef in the lagoon near an entrance to the lagoon. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 23048, My No. M. 427, collected at the same time and vicinity as the preceding. This species was common at Guam and fairly common at Ponapé.

The shape is massive to amorphous. The type specimen is 4 cm thick, but many other specimens were as little as 1 cm in vertical dimensions. In lateral growth, 11 cm was common.

The color in life was consistently purple. A few specimens deep inside the interior were drab, but these portions may have been pathological or moribund. The consistency was very soft and very fragile.



Text Figure No. 65. *Adocia viola. A:* Portion of a dermal pore, showing the sieve or network which it contains, X 182. *B:* Spicule with modified ends, X 781. *C:* Very thin spicula, perhaps juvenile, X 781. *D:* Oxea of more commonplace shape, X 781. This latter was from specimen number M. 526.

The surface is punctiform. Often the partitions between pores are as narrow as only 50 μ. The gross pores are about 250 μ in diameter; and the actual pores, which perforate the skin across the skeletal pores, are from 20 μ to 60 μ in diameter in the type specimen but 30 μ to 70 μ in some of those from Ponapé. The oscules vary in size up to about 5 mm in diameter—rather larger in specimens from Guam than in those from Ponapé. The distance apart is 1 to 3 cm.

The ectosome is not typical of *Adocia* but must be so classified, because it definitely does show a tangental isodictyal reticulation (although this is missing in places and often rather confused). The endosome also falls short of typical *Adocia* architecture. Much of it shows the isodictyal reticulation which would be expected; but there are also portions in confusion, and there are vague ascending tracts.

The skeleton consists of spicules very loosely attached to one another by dubious spongin and usually attached only at their ends. These are oxeas 3 μ by 120 μ to 4 μ by 116 μ. Specimen No. M. 421 had many spicules with a very peculiar modification. Each end was sharply truncated, as though the points had been cut off. In other cases, still more numerous, it was as though the end had been cut off and a series of successively smaller ends then superimposed, so that the termination comes down rapidly by a series of steps. It is rather clear that such a spicule was originally (in this case) an

oxea, but it might easily be confused with a strongyle. This one specimen is regarded as freakish or atypical in this regard.

The species *viola* is set off within the genus *Adocia* by the very small size of its spicules. The species *baeri* is similar in this regard, but black in life. The species *neens* also has small spicules, but they are typically strongyles.

The species name is given in respect to the color in life, a color which is shared with *Adocia cinerea.*

Adocia neens (Topsent) de Laubenfels

Text Figure No. 66

This species is here represented by the following:

U.S.N.M. No. 23001, My No. M. 380, collected July 11, 1949, by diver at Likiep Atoll in the southeast corner of the lagoon near the church. The depth was 3 meters, and the substrate was dead coral.

U.S.N.M. No. 23051, My No. M. 430, collected August 1, 1949, by diver in eastern Ponapé (Matalanim) from a reef in the lagoon near an entrance to the lagoon. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 23008, My No. M. 388, collected July 11, 1949, by diver at Likiep Atoll in the east end of the lagoon near Lado Islet. The depth was 5 meters, and the substrate was dead coral.

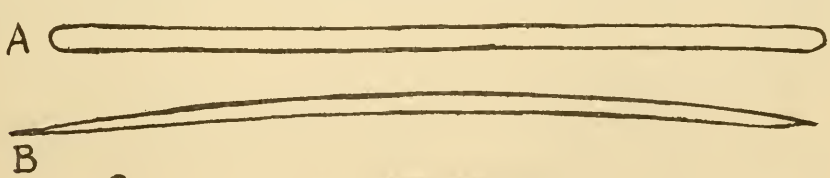
U.S.N.M. No. 22960, My No. M. 334, collected June 28, 1949, by diver in the north side of the lagoon of Majuro Atoll. The depth was 3 meters, and the substrate was dead coral.

This species was also collected in the summer of 1948, by T. E. Bullock, his No. C. 336, from Bikini Atoll.

The shape is incrusting, and the thickness is usually less than 1 cm; but in one of the Likiep specimens (No. M. 388) a thickness of 3 cm was reached in places. The lateral dimensions are sometimes as much as 17 cm.

The color in life was pale lavender, inside and out, and the consistency very spongy but somewhat fragile.

The surface is level, or microscopically somewhat lumpy. The pores are not microscopic, reaching a diameter of 400 μ in the Majuro specimen



Text Figure No. 66. Spicules of *Adocia neens. A:* Strongyle, the abundant sort, X 781. *B:* Oxea, very rare in this species, X 781. *C:* Juvenile spicule or perhaps a raphide, X 781.

No. M. 334. There are about 4 pores per square mm. A dermal network, quite characteristic of *Adocia,* covers the pores. The oscules are very conspicuous, 2 to often 6 mm in diameter and about 1 to 3 cm apart. They are on the summits of conspicuous volcano-like elevations, which often rise 5 to 9 mm above the general surface of the sponge.

The ectosome consists of an easily detachable, conspicuous dermis, which is made of a tangental layer of spicules arranged in isodictyal reticulation. The endosome is also emphatically isodictyal.

The skeleton consists of strongyles, about 3.5 μ by 140 μ in dimensions. In specimen No. M. 334 from Majuro, they were considerably smaller, only 2.5 μ by 80 μ. This specimen was abnormal, or unusual, in that it was rather full of embryos 200 μ to 400 μ in diameter. Some slight possibility exists that this was not really of the species *neens* but that the small size of its spicules may be associated with the reproductive condition.

This species was first described as *Reniera neens,* by Topsent, 1918, page 536, from the West Indies. It is common in that region. It may have been collected previously in the Pacific but not correctly identified, as there appear to be no records hitherto except from the western Atlantic.

Adocia turquoisia, new

Text Figure No. 67

This species is here represented by the following:

U.S.N.M. No. 23100, My No. M. 482, here designated as type, collected September 1, 1949, by diver in Iwayama Bay, Koror, in the Palaus. The depth was less than 2 meters, in discolored, muddy water, near mangroves. The substrate was coral fragments.

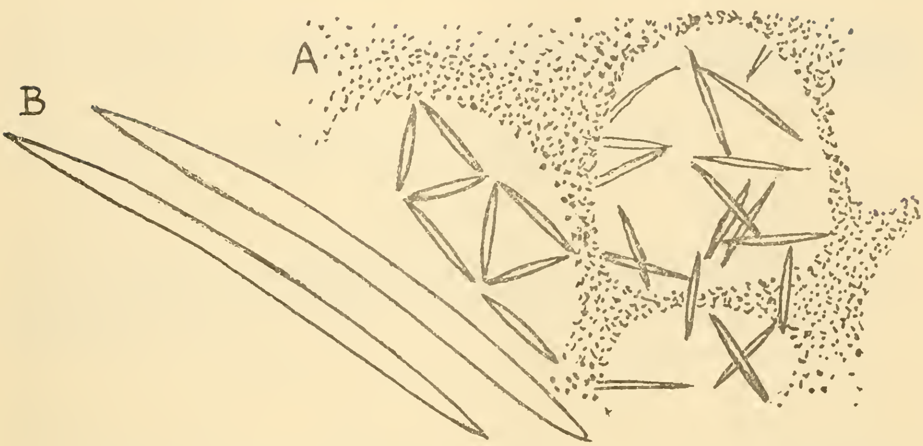
U.S.N.M. No. 22902, My No. M. 206, collected August 13, 1949, by hand while wading in the west portion of Truk lagoon just south of Pollé Islet. This was in discolored water near mangroves. The substrate was another living sponge, No. M. 466, *Biemma fortis.*

U.S.N.M. No. 22880, My No. M. 179, collected July 30, 1949, by diver in northwestern Ponapé in the lagoon close to the shore, near mangroves. The depth was less than 2 meters, and the substrate was dead coral.

U.S.N.M. No. 22834, My No. M. 114, collected June 28, 1949, by diver at Majuro Atoll near the north side of the lagoon. The depth was 3 meters, and the substrate was dead coral.

U.S.N.M. No. 22800, My No. N. 005, collected April 25, 1946, by J. P. E. Morrison at Bikini Atoll 7 kilometers south of the west end of Bikini Islet. This was dredged from a depth of 50 meters. The identification of this specimen is highly uncertain.

This species was fairly common in portions of the Truk region and locally abundant in the Palaus.



Text Figure No. 67. *Adocia turquoisia. A:* A portion of the surface, showing pores, and the network of spicules across each, X 162. *B:* Two of the spicules (oxea), X 781.

The shape is ramose. In places a series of low conical processes extend in a row so that the result is something like a cockscomb. A common vertical measurement is 3 to 6 cm, and the diameter or thickness was 1 cm.

The color in life was somewhat bluish green, both as to ectosome and endosome, and the consistency was softly spongy, easily torn.

The surface is very smooth. The pores are about 100 μ in diameter, but each is covered over by the typical adociid isodictyal dermal reticulation. The oscules are about 4 mm in diameter and 3 cm apart. There is some tendency to a raised rim about the oscules. They are not terminally placed but are on the sides of the sponge.

The ectosome is a typical adociid dermis, and the endosome is also an isodictyal reticulation.

The skeleton consists of oxeas attached to one another, presumably by spongin, at the ends only. These are 4 μ by 98 μ to 5 μ by 103 μ in dimensions.

If the various specimens studied during the summer of 1949 and attributed to this new species *turquoisia* are studied from the western portion of their range towards the eastern, one finds greener ones to the west and progressively more bluish specimens to the east. The Majuro specimens were almost clear blue. Also from west to east, the specimens become less and less ramose. Finally, in Majuro, some were entirely incrusting.

The species *turquoisia* is set off within the genus *Adocia* by the green or bluish-green color. Actually some specimens of *neens* from the West Indian region verge towards bluish, but *neens* is well marked by the strongylote nature of its spicules. Field observations made of both *neens* and *turquoisia* in Ponapé, where both occurred, tend to confirm the belief that they

are quite distinct species, but it is quite obvious to comment that further collections and study of the genus *Adocia* are needed.

GENUS *TOXADOCIA* de Laubenfels
Toxadocia tyroeis, new

Text Figure No. 68

This species is here represented by the following:

U.S.N.M. No. 23119, My No. M. 501, here designated as type. This was collected September 2, 1949, by divers northwest of Koror in Komebail lagoon in the Palaus. The depth was 5 meters, and the substrate was dead coral.

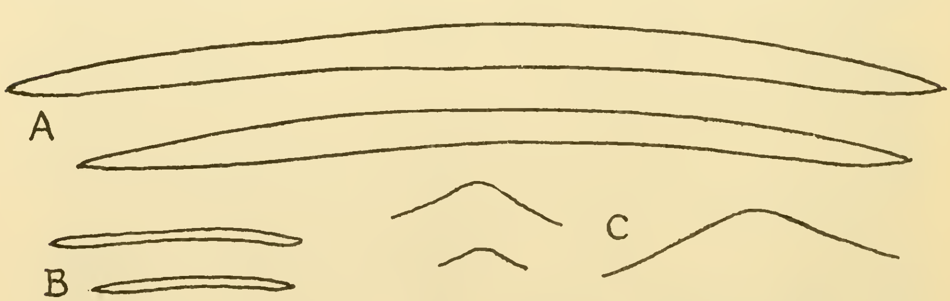
The shape is a rounded mass, 6 cm high, 7 by 9 cm in horizontal dimensions.

In life, the color of the exterior was carmine red. The interior was pale drab. The red color did not stop sharply, it blended into the drab throughout the dermal region, 2 mm thick. The consistency was astonishingly like that of cheese.

The surface is undulatory, with lumps close to 1 mm high, but very vague in outline. The pores are minute and closed, the oscules are 7 mm in diameter, and there were four on the type specimen.

The ectosome is only vaguely like that of either *Adocia* or *Toxadocia.* Perhaps it fundamentally is like that of *Adocia,* but is obscured by the protoplasm which gives rise to the cheese-like nature. The endosome is very crowded with protoplasm and with colloidal material of a gelatinous nature so that it looks, feels, and cuts like cheese. Within this endosome, the isodictyal structures are probably widespread but certainly not conspicuous.

The skeleton consists of megascleres of one kind and microscleres of two kinds. The former are oxeas, 5 μ by 140 μ to 6 μ by 160 μ. The microscleres include hastate diactines, 1.5 μ by 36 μ to 2 μ by 44 μ, and toxas of greatly varying size, from at least 15 μ to 50 μ in total length.



Text Figure No. 68. Spicules of *Toxadocia tyroeis,* X 781. *A:* Two of the oxeas. *B:* Two microxeas. *C:* Three toxas.

The spiculation of oxeas with toxas is characteristic of *Toxadocia.* The hastate microscleres and the abundance of protoplasm and colloid producing the cheese-like consistency is not only unique in the genus *Toxadocia* but sets this sponge so drastically aside that it may well deserve a new genus. This step is, however, postponed at the present time.

The specific name is derived from the Greek word for "cheese-like."

There are two species which should now be transferred to the genus *Toxadocia.* They are the ones first described as:

Toxochalina borealis Lambe, 1894, page 15, Western Canada.

Toxochalina robusta Ridley, 1884, page 403, East Indies.

GENUS *SIGMADOCIA* de Laubenfels

Sigmadocia emphasis, new

Text Figure No. 69

This species is here represented as follows:

U.S.N.M. No. 23099, My No. M. 481, here designated as type, collected September 1, 1949, by diver in Iwayama Bay, Koror, in the Palaus. The depth was less than 2 meters, in muddy water, near mangroves; the substrate was coral fragments. This species was very common in such localities in the Palaus.

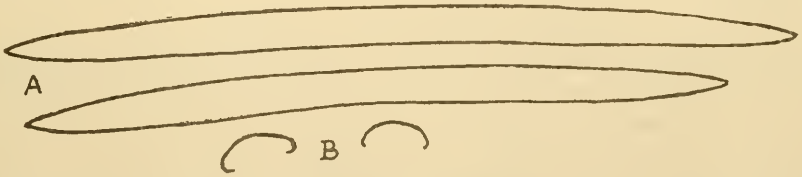
The shape is massive to amorphous, and individuals were often 4 by 6 by 6 cm in size.

The color in life was dull lavender on the exterior and drab within. The consistency was softly spongy, easily cut.

The surface is distinctive. It is between coarsely velvet-like and very finely conulose. It is covered with myriads of small projections, each less than 1 mm high and 1 mm apart. The pores are about 250 μ in diameter when alive, but very readily closed by membranes which pull across. They are chiefly closed in the preserved specimens. The oscules are 4 mm in diameter, do not close, and are very few in number.

The ectosome is a thin, definite dermis, very full of sigmas. The endosome is isodictyal, nonfibrous, and typical of the family Adociidae.

The skeleton consists of oxeas, often united end to end by a little spongin. They range from 9 μ by 185 μ to 10 μ by 205 μ in dimensions.



Text Figure No. 69. Spicules of *Sigmadocia emphasis,* X 781. *A:* Two of the oxeas. *B:* Two of the sigmas.

There are also very abundant sigmas, typical in shape and 17 μ to 18 μ in chord measurement.

This new species differs from others within the genus throughout the world in numerous ways, including spicule size, but has for its closest relatives two species described from the nearby East Indian region, which two might be expected to be closely related to *emphasis*. Yet each of these (which actually may be conspecific with one another) is characterized by extremely smooth surface, whereas the present species has the very distinctive microconulose surface. The two East Indian species here referred to were originally described as follows: *Gellius glaberrimum* Topsent, 1897, page 471, and *Gelliodes porosa* Thiele, 1905, page 943.

The new species receives its name from a Greek word referring to "outward appearance."

GENUS *KALLYPILIDION*, new

This genus is here established within the family Adociidae, to have as genotype the species *Kallypilidion poseidon*. It is characterized sharply by its external shape, which is regularly that of a very thin-walled bowl or vase. It is easily detached from the substratum and, when turned upside down, strikingly resembles a brimless cap, such as a man might wear. The name is derived from the Greek for "beautiful hat," or cap.

Kallypilidion poseidon, new

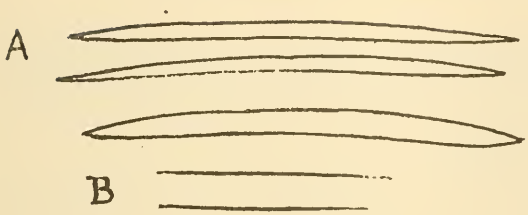
Text Figure No. 70
Plate IX, Figure a

This species is here represented by the following:

U.S.N.M. No. 23121, My No. M. 503, here designated as type, collected September 2, 1949, by diver northwest of Koror near Ngarebagal Island in the Palaus. The depth was 3 meters, and the substrate was dead coral.

U.S.N.M. No. 22911, My No. M. 216, collected August 13, 1949, by diver from the west part of Truk lagoon in Lemotol Bay. The depth was 4 meters, and the substrate was dead coral. This species is fairly common in the Truk lagoon but even more common in the lagoons about the Palaus.

The shape is described in the generic diagnosis given above. Specimens from the Truk region reached a vertical measurement of 14 cm and a diameter of 11 cm. The walls at the thickest were rarely 3 or 4 mm, and the upper portions of the walls were as thin as paper. Specimens from the Palaus were as much as 30 cm high and 20 cm in diameter. They showed a maximum wall thickness of 5 mm, but most of the wall was only about 1 or 2 mm thick.



Text Figure No. 70. Spicules of *Kallypilidion poseidon,* X 781. *A:* Three of the oxeas. *B:* Two spicules, perhaps juvenile, perhaps to be called raphides.

The color in life was a vivid light blue, not at all greenish but rather verging very slightly toward violet. The consistency was flexible, like that of wet paper.

The surface is mostly very smooth, but here and there a few small lumps occur, about six or eight per specimen. The exterior of the bowl is covered with compound pores, the skeletal pores being 400 μ to 500 μ in diameter and the actual pores about 50 μ in diameter and separated from each other by only very narrow strands. The exhalant apertures which cover the interior of the bowl may be regarded as the oscules, although the upper opening of the bowl might be so interpreted. These exhalant openings (apopores) are about 0.5 to 2 mm in diameter, and there is about one to each square mm.

The ectosome consists of a tangental isodictyal reticulation, as characteristic of the Adociidae, and the endosome is also strikingly isodictyal in nature.

The skeleton consists of spongin, which unites in reticulation the oxeas, which latter are 2 μ by 64 μ to 3.5 μ by 77 μ in dimensions. A few much smaller and thinner ones may be juvenile. In addition to the basal isodictyal reticulation, there are present also tracts of fibers containing a moderate amount of spongin. These tracts are 30 μ to 40 μ in diameter and consistently about 200 μ apart. The rather rectangular meshes formed by these tracts of fibers are visible to the naked eye when dried specimens of this species are held to the light.

The species name refers to the Greek deity Poseidon, called by the Romans Neptune, who presumably reigned over the ocean. The suggestion is here offered that such sponges as these might have been used by this sea god as a head gear.

GENUS *ICHNODONAX,* new

This genus is here established in the family Adociidae, to have as genotype the species *Ichnodonax kapne.* It is characterized by a spiculation of large oxeas, small strongyles, and palmate isochelas. It is placed in the family Adociidae with some hesitation, because the dermis is not typical. Nevertheless there is enough of a dermal tangent reticulation that the family Desmacidonidae is contra-indicated. The nearest relative, however, may be the genus

Dendoricella, in the Desmacidonidae, which is almost the only other sponge with similar megascleres. The microscleres which occur in the type species of *Dendoricella* are very peculiar chelas with stegosaurian projections on their convex side. The other species referred to *Dendoricella* has chelas which are between palmate and arcuate.

The type species of *Ichnodonax* is characterized by a peculiar shape in which cylinders arise at intervals from a buried rhizome so that they look almost like footprints as they reach the surface. The generic name selected is derived from the Greek for "a series of tracks."

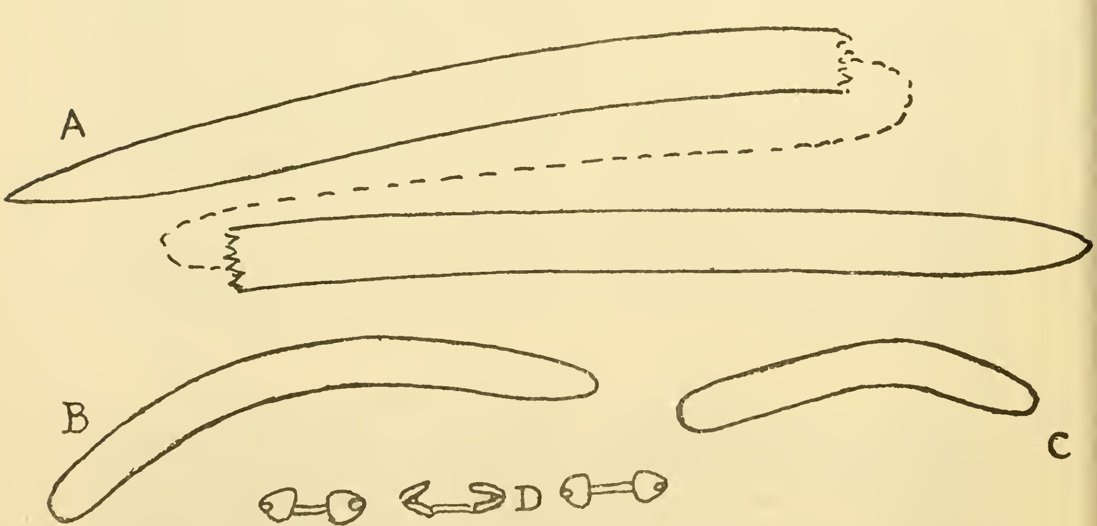
Ichnodonax kapne, new

Text Figure No. 71
Plate VI, Figure a

This species is here represented by the following:

U.S.N.M. No. 23130, My No. M. 513, here designated as type, collected September 6, 1949, by using a fish spear in Iwayama Bay near Ulebsechel Island. The depth was less than 2 meters, and the sponge was living partially buried in coral sand.

This species consists primarily of a rhizome, nearly 1 cm in diameter, which was buried in sand. It extended laterally at least 10 cm. The portion which was collected probably represents only a fragment of the whole. From this buried portion chimneys arise at intervals. These hollow cylinders are commonly 3 to 4 cm high and reach 14 mm in diameter. Only one has the



Text Figure No. 71. Spicules of *Ichnodonax kapne,* X 781. *A:* Oxea; the entire spicule is shown, but in two parts. *B* and *C:* Two of the strongyles. *D:* Three of the palmate isochelas; the central one of the three is drawn as seen in side view.

latter size, however; most of them are less than 6 mm in diameter. The walls of these chimneys are less than 1 mm thick. The central portion, however, is not completely hollow but is partially subdivided by fibers which outline an exceedingly openwork and cavernous endosome.

The color in life was dark olive and medium yellow; the large chimney was medium yellow; the other chimneys were between dark olive and yellow. The consistency was stiffly spongy, rather fragile. The dried specimen first became a pale dull red, but after six months it became brown. The dried specimen is very brittle.

The surface is exceptionally smooth. The pores are very small, and the situation with regard to oscules is very difficult to understand. There is one obvious oscule at the summit of the single largest chimney; it is 8 mm in diameter. All the other upright projections are closed over at the upper end. Perhaps some of the microscopic and readily closed openings were exhalant. On the other hand, it appears more likely that most of the sponge was inhalant, and all the water from the canal system found its outlet at the single exit. Another hole on the rhizome resembles an oscule, however.

The ectosome is dense in structure with tangent spicules in abundance. The endosome contains a reticulation of spicular tracts, 35 μ to 63 μ in diameter, 20 to 50 spicules per cross-section. These outline meshes are often about 300 μ in diameter. Between and among the fibers, there is a vague isodictyal reticulation of spicules, and there are spicules in confusion.

The skeleton comprises two distinct categories of megasclere. There are large oxeas, 11 μ by 290 μ, and strongyles, often somewhat curved, 6 μ by 60 μ to 8 μ by 100 μ. The microscleres are palmate isochelas, 18 μ to 20 μ long.

This species is set off by the generic characteristics, as already discussed.

The species name is derived from the Greek for "chimney."

FAMILY AGELASIDAE Verrill

GENUS *AGELAS,* Duchassaing & Michelotti

Agelas mauritiana (Carter) de Laubenfels

Text Figure No. 72

This species is here represented by the following:

U.S.N.M. No. 22961, My No. M. 335, collected June 28, 1949, by diver at Majuro Atoll at the north side of the lagoon near Enemanok Islet. The depth was 2 meters and the substrate was dead coral.

U.S.N.M. No. 22959, My No. M. 333, collected at nearly the same time and locality as the preceding.

U.S.N.M. No. 22997, My No. M. 375, collected July 7, 1949, by diver from the open ocean just off Rubé Point at Ebon Atoll. The depth was 3 meters, and the substrate was dead coral.

U.S.N.M. No. 22802, My No. N. 007, collected April 25, 1946, by J. P. E.

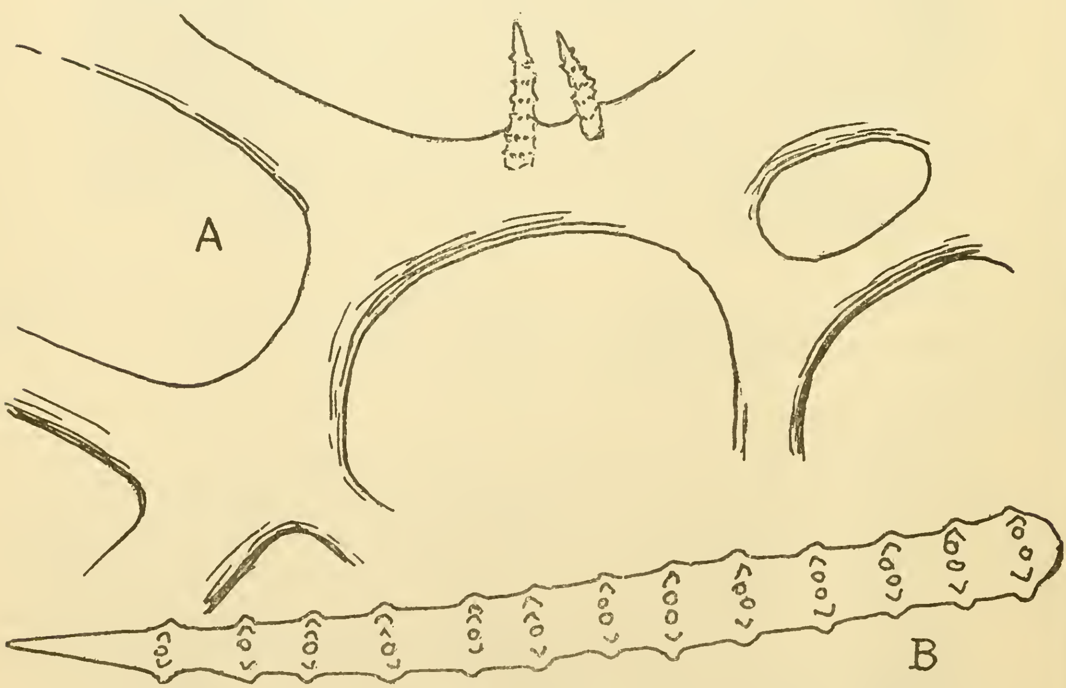
Morrison at Bikini Atoll, 7 kilometers south of the west end of Bikini Islet. This was dredged from a depth of 50 meters on a bottom of coralline algae (*Halimeda*).

U.S.N.M. No. 22804, My No. N. 009, collected at the same time and locality as the preceding, a typical *mauritiana*.

U.S.N.M. No. 22809, My No. N. 015, collected June 5, 1946, by W. R. Taylor at Eniwetok Atoll, 8 kilometers north of the south anchorage in the center of the lagoon. This was dredged from a depth of 35 meters.

On August 3, 1949, sponges were collected in the western portion of Ponapé from the reef near Tavak Passage at a depth of 3 meters. These contained foreign spicules certainly of the genus *Agelas*, almost certainly of the species *mauritiana*. This warrants including *Agelas* in the fauna of Ponapé.

The first specimen is oval and 4 cm in diameter; the second is a crust, 1 cm thick and 6 cm in diameter; and the third is ramose with branches less than 1 cm in diameter and a total height of 6 cm. The latter probably represents the real shape for this species, the other two having been stunted by environmental conditions. The specimens from Bikini (apparently from the same dredge haul) vary from massive to string-like ramose.



Text Figure No. 72. *Agelas mauritiana*. *A:* A bit of the skeletal reticulation, X 182. *B:* One of the spicules (verticilate acanthostyle), X 781.

The exterior color in life was brilliant orange. The interior was paler and duller, almost drab. The color is maintained astonishingly long in alcohol. The consistency was strongly spongy, like a commercial sponge.

The surface is verrucose, or wart-like, with projections up to 5 mm high and 5 mm in diameter, separated from each other by meandering valleys some 3 or 4 mm in diameter. This labyrinthine region is roofed over by a thin protoplasmic dermis about 10 μ thick. Underneath this roof is an extensive subdermal space, exactly as in the genus *Hippiospongia.* These warts or islands, as described above, are in turn tuberculate or of granular surface. Oscules cannot readily be found. The exhalant system doubtless makes use of openings from the extensive subdermal space, but these openings are very readily closed by the muscular cells in the dermis.

The ectosome has been described in discussing the surface. The endosome consists primarily of a dense reticulation of clear fibers very much like those in the genera *Spongia* and *Hippiospongia.* There is little space left for the flesh, and particularly for the flagellate chambers, yet these are astonishingly abundant, taking advantage of every interstice. They are spherical, some 30 μ in diameter, so that not only the fibers but also the flagellate chambers closely resemble those which characterize the genera *Spongia* and *Hippiospongia.*

The skeleton consists of fibers which retain their elasticity when dry, which is true of very few sponges but is true of the best commercial ones. These fibers are chiefly of the type which has been regarded as secondary, about 50 μ to 80 μ in diameter. There are no obviously ascending fibers. The one thing that separates this species from the genus *Hippiospongia* is the fact that fairly abundantly scattered over the fibers, with the heads imbedded and with points projected outward, are very characteristic megascleres. These are acanthostyles with the spines in symmetrical whorls, about 12 to 18 such nodes per spicule. The sizes range from about 10 μ by 170 μ to 14 μ by 180 μ.

This species was first described by Carter, 1883, page 310, as *Ectyon mauritianus,* from the central Indian Ocean. It is characterized, as compared to other species in the genus, by the comparatively large spicules. There is a good deal of possibility that it should fall in synonymy to the species which was first described as *Alcyonium sceptrum* by Lamarck, 1815, page 163, from a locality not specified.

Carter in 1885, page 316, described a sponge as *Euspongia anfractuosa.* Lendenfeld, 1889, page 313, discussed this further, extending its range throughout the Australian and East Indian region. According to the descriptions of both Carter and Lendenfeld, this species is a typical *Hippiospongia* but differs from others in that genus almost exclusively by its color in life, which is described as bright orange. It is worthy of note that the obviously proper echinating spicules of *Agelas* are very difficult to find in some speci-

mens as, for example, No. M. 333 discussed above. Such a specimen becomes more typical of the genus *Hippiospongia* than any except the very most typical specimens thereof. It is suggested here that the various specimens which have been called *anfractuosa* should fall in synonymy to *mauritiana,* which thus becomes a sponge with a widespread distribution from the central Indian Ocean throughout the Australian, East Indian, and now western Pacific areas.

FAMILY PHORBASIDAE de Laubenfels
GENUS *KIEPLITELA,* new

This genus is here established for sponges of extremely cavernous nature. The soft parts are distributed along coarse fibers, which make an openwork reticulation having meshes 5 to 8 mm in diameter. Within the genus *Mycale* there is a group of species of similar openwork structure, but it is found in few, if any, other places throughout the whole phylum Porifera. The spiculation of *Kieplitela* is somewhat like that of *Echinodictyum.* The type of this latter genus (*Echinodictyum topsenti* de Laubenfels) has fibers cored with oxeas and echinated by acanthostyles. The same is true of *Kieplitela;* but the structure of *topsenti* is dense, and its skeleton consists of spicular tracts rather than fibers. These tracts are profusely echinated, whereas in *Kieplitela* the echinating spicules are fairly rare. Furthermore, most of the species that quite properly are referred to the genus *Echinodictyum* have coring spicules which are in some cases styles and in other oxeas and in several species are only styles without any oxeas. Probably that species of all those in *Echinodictyum* which is closest to *Kieplitela,* having a somewhat cavernous structure, is *Echinodictyum asperum,* Ridley and Dendy, 1886, page 477, from the South Pacific region. Its spicules, however, are altogether monaxon.

Another genus which may be related here was established by I. Sollas, 1908, page 395, from the Indian Ocean coast of Africa. This genus is called *Migas,* and the one species is *M. porphyrion.* Sollas does not describe any echinating spicules; and, as these are rare in *Kieplitela,* they may have been rare in *Migas.* But their presence cannot be taken for granted; furthermore *Migas* was not so cavernous as *Kieplitela* and did contain foreign material (such as sand) in considerable quantity. The name *Migas* was preoccupied in 1873 by Koch for an arachnid, therefore a new name is needed.

GENUS *MILENE,* new name

This is here established to replace the preoccupied name *Migas,* a genus of keratose appearance with spicules exclusively oxeas, type *M. porphyrion* I. Sollas, 1908, page 395.

Kieplitela antrodes, new

Text Figure No. 73
Plate VII, Figure a

This species is here represented by the following:

U.S.N.M. No. 23019, My No. M. 399, here designated as type, collected July 15, 1949, by diver in Likiep Atoll near the south portion of the lagoon in the vicinity of Lukonwoerr Islet. The depth was 4 meters, and the substrate was dead coral. The species was fairly common in only this portion of Likiep lagoon.

. . . This species was also collected in 1948 at Bikini Atoll by Dr. T. E. Bullock, his number C. 337. Very little collection data is available for this specimen.

U.S.N.M. No. 22875, My No. M. 172, collected July 30, 1949, by diver in northwest Ponapé between the reef and the shore. The depth was 4 meters, and the substrate was dead coral. The species is fairly common in Ponapé, being noticed also all the way around to southwest Ponapé near the province of Kiti.

U.S.N.M. No. 23064, My No. M. 444, collected August 3, 1949, by diver from a reef in the lagoon near shore in southwest Ponapé (Kiti) near Toletik Isle. The depth was 4 meters, and the substrate was dead coral. As will be discussed further below, this specimen is exceedingly atypical and may represent another species or even another genus.

U.S.N.M. No. 22801, My No. N. 006, collected April 25, 1946, by J. P. E. Morrison at Bikini Atoll, 7 kilometers south of the west end of Bikini Islet. This was dredged from a depth of 50 meters. The substrate was coralline algae.

U.S.N.M. No. 23107, My No. M. 489, collected September 1, 1949, by divers from Iwayama Bay near Koror in the Palaus. The depth was 2 meters, and the substrate was dead coral. This species is very common in the Palau Archipelago.

U.S.N.M. No. 23148, My No. M. 532, collected September 20, 1949, by diver in northwest Guam at Dungas Beach northeast of Agana. The depth was less than 2 meters, and the substrate was dead coral. The species was also found in some abundance at Merizo Bay at the extreme south end of Guam so that it is one of the commonest of the very few species occurring around Guam.

The shape of this species is typically clavate, or club-shaped, although older, larger specimens may become irregularly massive. A typical size is 12 cm in height and 7 cm in diameter at the largest place and about 3 cm in diameter at the point of attachment. Some reach a maximum dimension of 15 cm in height and 18 cm in diameter.

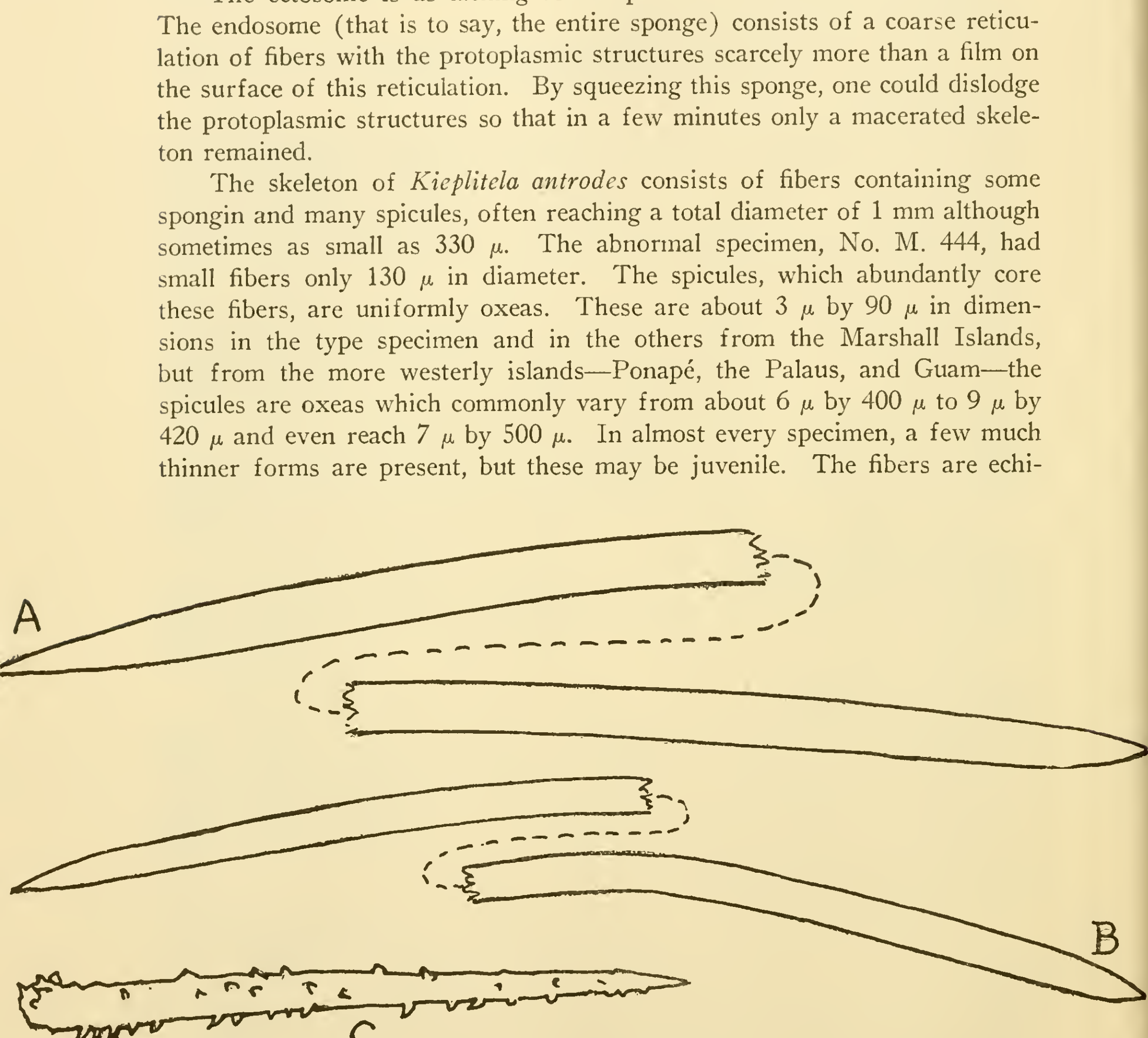
The color in life, of all the numerous specimens studied in the field, with a single exception, was uniformly jet black. The specimen No. M. 444

from Ponapé, at the time of collection, was brown. Inasmuch as it had some other striking discrepancies, there is some doubt that it is the same species or, if it is the same species, that it was in healthy condition at the time of collection. It may have been pathological. The consistency was regularly emphatically spongy.

The surface, the pores, and the oscules are all impossible to describe in view of the exceedingly peculiar architecture of this species and genus.

The ectosome is as lacking as the pores and other surface structures. The endosome (that is to say, the entire sponge) consists of a coarse reticulation of fibers with the protoplasmic structures scarcely more than a film on the surface of this reticulation. By squeezing this sponge, one could dislodge the protoplasmic structures so that in a few minutes only a macerated skeleton remained.

The skeleton of *Kieplitela antrodes* consists of fibers containing some spongin and many spicules, often reaching a total diameter of 1 mm although sometimes as small as 330 μ. The abnormal specimen, No. M. 444, had small fibers only 130 μ in diameter. The spicules, which abundantly core these fibers, are uniformly oxeas. These are about 3 μ by 90 μ in dimensions in the type specimen and in the others from the Marshall Islands, but from the more westerly islands—Ponapé, the Palaus, and Guam—the spicules are oxeas which commonly vary from about 6 μ by 400 μ to 9 μ by 420 μ and even reach 7 μ by 500 μ. In almost every specimen, a few much thinner forms are present, but these may be juvenile. The fibers are echi-



Text Figure No. 73. Spicules of *Kieplitela antrodes,* X 781. *A* and *B:* Oxeas. In each case the entire spicule is shown, but in two parts. *C:* One of the echinating acanthostyles.

nated by typical acanthostyles, but in very small numbers so that they may be easily overlooked. These are about 3 μ by 90 μ in dimensions in the specimens of *antrodes* from the Marshall Islands but are somewhat larger, about 6 μ by 120 μ, in the specimens from further west such as Ponapé, the Palaus, and Guam. Spicules of this type seem to be entirely and completely lacking from the abnormal specimen, No. M. 444. It may belong in *Milene.*

An item in the literature which most nearly resembles *antrodes,* at least superficially, is a photograph by Lendenfeld, 1888, "Sponges of the Australian Museum," plate xi. This is now classified as *Fasciospongia turgida* and presumably has no proper spicules. Its cavernous nature well may be due to macerated condition.

The species name is derived from the Greek word meaning "cavernous."

GENUS *MYRMEKIODERMA* Ehlers

Myrmekioderma tylota, new

Text Figure No. 74

This species is here represented by the following:

U.S.N.M. No. 23059, My No. M. 439, here designated as type, collected August 3, 1949, by diver in southwest Ponapé (Kiti) near Toletik Isle from a reef in the lagoon near shore, where this species was abundant. The depth was 4 meters, and the substrate was dead coral.

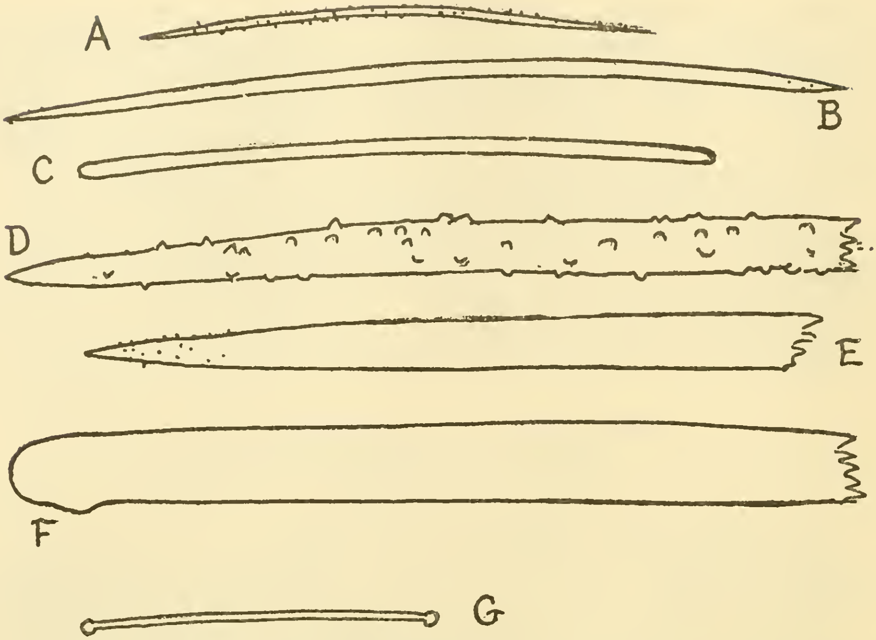
U.S.N.M. No. 23041, My No. M. 420, collected August 1, 1949, by diver from east Ponapé (Matalanim) from a reef near an entrance to the lagoon. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 22887, My No. M. 187, collected August 3, 1949, by diver from southwest Ponapé (Kiti) near Toletik Isle from a reef in the lagoon near shore. The depth was 4 meters, and the substrate was dead coral.

This species is incrusting when young but soon becomes rounded masses, sometimes nearly hemispherical. These masses range from 2 to 4 cm in vertical dimensions and from 6 to 8 cm to 10 by 10 cm in horizontal dimensions.

The color in life was predominantly ochre yellow; it was, sometimes, but not always, duller in the interior. The exterior was regularly covered with considerable quantities of debris—diatoms and bits of sand—so that it appeared dark drab, with the exception of the pore cracks, to be mentioned below, which showed yellow through the detritus. The consistency was soft, very much like that of cheese.

The surface is covered throughout with wide, low protrusions, rounded in outline, or polygonal because of crowding. Their diameter is about 7 to 10 mm, and they rise about 1 mm. On the other hand, this structure could be described as a fairly level surface cut up by pore grooves 1 mm deep and



Text Figure No. 74. Spicules of *Myrmekioderma tylota*. *A:* Acanthoxea of the abundant type, X 182. *B:* Oxea with only the ends slightly spined, X 182. *C:* Smooth strongyle, chiefly ectosomal, X 182. *D:* One end of a spicule such as *A*, but X 781. *E:* One end of a spicule such as *B*, but X 781. *F:* One end of a spicule such as *C*, but X 781. *G:* Tylote microsclere, X 781.

1 to 3 mm wide. These pore cracks separate the surface into rounded or polygonal islands. Inasmuch as oscules are conspicuously lacking, it furthermore must be true that some of the openings in these cracks shall be exhalant and others are inhalant.

The ectosome is quite complicated. On the very outside, there is a region marked by spicules protruding here and there, so that the term hispid almost is warranted. Among these spicules are numerous bits of foreign material. This layer is about 150 μ thick, and some of the spicules protrude an additional 100 μ past the detritus. Below this there is a layer of flesh arranged in horizontal strands, making a dermis 30 μ thick. Below this second layer are extensive subdermal spaces about 220 μ high. The ceiling of this subdermal space is held up by numerous columns of spicules about 40 μ to 50 μ in diameter. In this subdermal space, particularly in Specimen No. M. 420, there occur numerous embryos about 75 μ to 175 μ in diameter. These take various stains very deeply. Below, the endosome is marked by an immense number of spicules packed together in confusion, pointing in all directions. The flagellate chambers are oval and upwards of 60 μ in diameter.

The skeleton consists almost exclusively of spicules and colloidal material. The commonest megascleres are acanthoxeas ranging from 5 μ by 300 μ to 9 μ by 620 μ in dimensions. The spines are exceedingly abundant and very minute, and in the smaller spicules the spines are confined to the small region near the ends of the spicule. The second type of megasclere is a smooth strongyle 8 μ by 400 μ to 13 μ by 710 μ in dimensions. These are not particularly localized but do seem to be a little more predominant in the ectosome than in the endosome. The microscleres are tylotes with very conspicuous, relatively large spherical heads. They range in size from 1 μ by 60 μ to 2 μ by 140 μ in dimensions of the shafts. The heads in either case are at least 1 μ greater in diameter than the shaft.

This species is sharply set off from the only other one in the genus *Myrmekioderma* by possession of these distinctive microscleres. The species name *tylota* is derived from their presence.

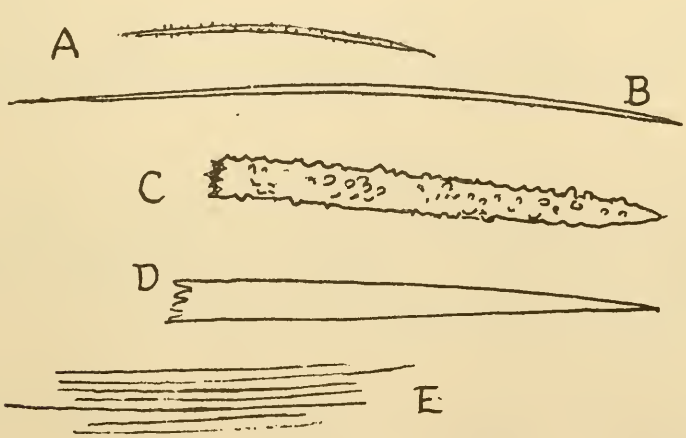
Myrmekioderma granulata (Esper) Ehlers

Text Figure No. 75

This species is here represented by the following:

U.S.N.M. No. 23073, My No. M. 453, collected August 10, 1949, by diver in Truk lagoon near Moen Island. The depth was 4 meters, and the substrate was dead coral.

The shape is massive and the size much larger than any of those of the preceding species, but only the one specimen was found in the Truk lagoon.



Text Figure No. 75. Spicules of *Myrmekioderma granulata*. *A:* Acanthoxea of the abundant type, X 182. *B:* Less common type of oxea, X 182. *C:* One end of a spicule such as *A,* but X 781. *D:* One end of a spicule such as *B,* but X 781. *E:* Raphides, X 781.

This had a vertical measurement of more than 10 cm and a horizontal measurement of about the same.

The interior and exterior color in life was dull yellow, and the consistency was cheese-like.

The surface is exactly as in the preceding species—divided by ramifying pore canals into rounded islands about 7 to 10 mm in diameter. The pore grooves are about 1 mm deep and often less than 1 mm wide. The sponge appears to be lipostomous; the exhalant as well as inhalant openings must be located in these valleys.

The ectosome and endosome also resemble the preceding species.

The skeleton consists of acanthoxeas, about 6 μ by 250 μ in dimensions, and smooth oxeas, 7 μ by 500 μ to 10 μ by 600 μ in dimensions. The microscleres are trichodragmas, about 60 μ long.

This species was first described as *Alcyonium granulatum* by Esper, 1830, page 71. The genus *Myrmekioderma* was established for it by Ehlers, 1870, page 28. Neither of these authors makes any mention of microscleres, but it is considered likely that trichodragmas would be overlooked more easily than the very striking spicule known as the tylote. Esper's specimens were from the East Indies, and thus there is a high degree of probability that they are the same species as this from Truk. However, in Esper's specimen (as redescribed by Ehlers), whereas the acanthoxeas were about the same size as the Truk specimen, the oxeas are mentioned as smaller instead of larger in size. Therefore, it is possible that a new species should be erected for Specimen No. M. 453.

FAMILY MYXILLIDAE Hentschel

GENUS *HIATTROCHOTA* de Laubenfels

Hiattrochota ditrochota, new

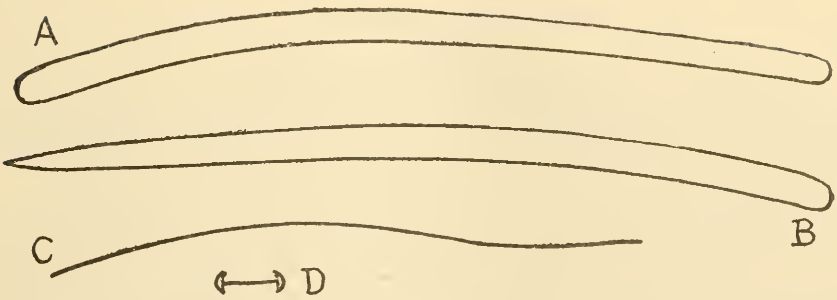
Text Figure No. 76

This species is here represented by the following:

U.S.N.M. No. 23021, My No. M. 400, here designated as type, collected July 30, 1949, by diver in northwest Ponapé between the reef and the shore. The depth was 5 meters, and the substrate was dead coral. This species was very common in the waters near Ponapé.

The shape is ramose, often sprawling, with many anastomoses between the branches. The latter are about 15 to 25 mm in cross-section. Instead of being round, this cross-section is exceedingly irregular in outline. The vertical measurement extends up to at least 50 cm.

The color in life was black with a superficial film of yellowish green, and the interior was the same color. Upon handling, a profuse exudate of



Text Figure No. 76. Spicules of *Hiattrochota ditrochota,* X 781. *A:* Strongyle from the ectosome. *B:* Style from the endosome. *C:* Raphide. *D:* Amphidisc microsclere.

bright purple colloid was given off. The consistency was tough and stiffly spongy.

The surface is rough, irregularly conulose. The pores and oscules close so promptly that they could not be made out.

The ectosome consists of a fleshy dermis about 10 μ thick. The endosome is permeated by an irregular fibro-reticulation and is abundantly provided with protoplasmic material.

Whereas reference is made to fibers, the structures in question are so vague and irregular that dimensions are scarcely appropriate. They are crowded with spicules. The megascleres are roughly divided into dermal and endosomal type, but the distinction is not hard and fast. Most of those near the surface, but also some which line the larger canals, are strongyles 6 μ by 144 μ in dimensions. Most of the spicules which core the fibers and are scattered loosely throughout the flesh are styles of the same dimensions, 6 μ by 144 μ. The microsclеres include raphides, 0.5 μ by 110 μ, and amphidiscs or birotulate spicules 11 μ to 12 μ in length. There seem to be at least 8 clads at each end or head of these microscleres, but the exact number of clads is difficult to make out because of the small size.

This species is unique in the genus *Hiattrochota* for the ramose form and for the raphides, which are also worthy of a special comment. Attention is called to the fact that in external shape this species is very much like some of those in *Iotrochota.* The thin film of yellowish-green is strongly reminiscent of *Iotrochota birotulata* of the West Indies. Thus, this species has as perhaps its closest relative sponges which are still in a different family, namely Desmacidonidae. It is well to anticipate that at some future date there may be a considerable reshuffling of genera and even families within the orders Haplosclerina, Poecilosclerina, and Halichondrina.

The specific name is from the Greek, as descriptive of microscleres.

Hiattrochota baculifera (Ridley) de Laubenfels

Text Figure No. 77

This species is here represented by the following:

U.S.N.M. No. 22923, My No. M. 229, here designated as type, collected September 1, 1949, by diver in Iwayama Bay near Koror in the Palaus. The depth was 2 meters, and the substrate was dead coral.

The shape is thinly incrusting or, in some cases, a mass full of coarse coral. Of the latter, it may be regarded that the large coral particles are thinly incrusted and held together by sponge tissue. Because of this peculiar structure, it is difficult to give dimensions for this species as found in the Palaus.

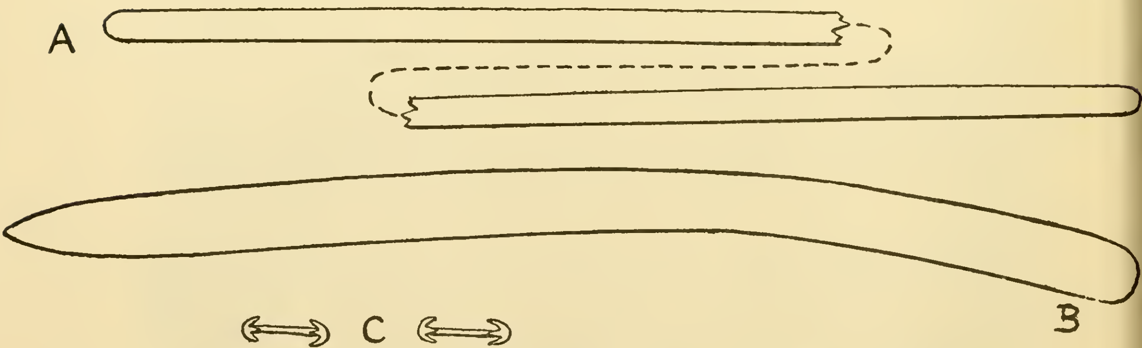
The exterior and interior color in life was purplish-black or blackish-purple. There was no green wash over the surface, but the specimens did bleed a rich purple exudate when handled. The consistency was colloidal with obviously stiffly spongy fibers present.

The surface is conulose with conules 2 mm high and 2 to 5 mm apart. The pores and oscules cannot be discerned.

The ectosome consists of a thin dermis, protoplasmic in nature, about 10 μ thick. The endosome is softly colloidal with a loose irregular reticulation of spongin fibers.

The skeleton, while fibrous, is so irregular that dimensions of the fibers cannot readily be given. The spicules consist of smooth strongyles, chiefly in the ectosome, 5 μ by 250 μ in dimensions, and smooth styles, chiefly in the endosome, 11 μ by 195 μ. The microscleres are birotulates, 14 μ to 16 μ in length, and apparently have just 4 clads at each end, no more.

This species was first described as *Iotrochota baculifera* by Ridley, 1884, page 435, from the Indian Ocean and the Australian region in general. Thiele, 1899, page 18, extended its range into the East Indian area. It is here for the first time transferred into the genus *Hiattrochota.*



Text Figure No. 77. Spicules of *Haittrochota baculifera,* X 781. *A:* Strongyle from the ectosome. *B:* Style from the endosome. *C:* Amphidisc microscleres.

Hiattrochota hiatti, new

Text Figure No. 78

This species is here represented by the following:

U.S.N.M. No. 23087, My No. M. 469, here designated as type, collected August 13, 1949, by diver from Lemotol Bay in the west part of the Truk lagoon. The depth was 2 meters, and the substrate was dead coral. This species was extremely abundant in the vicinity of Lemotol Bay and moderately abundant throughout the Truk region in general.

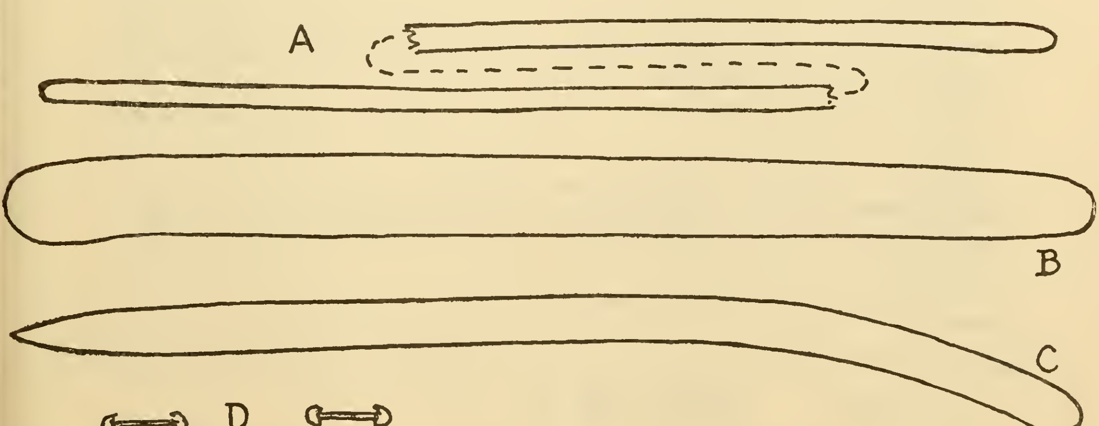
The shape is briefly incrusting when young. This sponge quickly rises up to a massive shape but definitely is not ramose. The vertical measurement is often as much as 15 cm, the lateral dimensions as much as 20 by 30 cm.

The exterior and interior color in life was black. The purple sol given off upon handling was very much in evidence as in other species of *Hiattrochota* and *Iotrochota*. The consistency was stiffly spongy.

The surface is exceedingly irregular. There are many lumps about 2 mm high and 2 mm in diameter; but these in turn are covered with small tubercles, and there are smaller tubercles between them. The pores and oscules, being closed, cannot be made out.

The ectosome consists of a very thin protoplasmic dermis, chiefly in evidence between the tubercles and not much over 10 μ in thickness. The endosome is vaguely reticulate and is thickly filled with colloidal material and cells.

The skeleton consists of very abundant spicules interconnected by rather small quantities of spongin. There are two distinct categories of strongyles: smaller straight strongyles, 4 μ by 245 μ, are somewhat more common at the



Text Figure No. 78. Spicules of *Hiattrochota hiatti*, X 781. *A:* Strongyle from the ectosome. The entire spicule is shown, but in two parts. *B:* Strongyle from the endosome, not common. *C:* Style from the endosome, a common type. *D:* Two of the amphidiscs.

surface than elsewhere and may be regarded as an ectosomal category, or type. Larger strongyles, 13 μ by 185 μ in dimensions, are somewhat less common. Most of the spicules of the interior are styles, 7.5 μ by 183 μ, and very often bent rather sharply near the blunt end. The microscleres consist of birotulates 14 μ in length. The clads or teeth, if any, are so small that the number cannot be counted. It is almost as though the heads of these spicules were saucers with even rims.

This species, which is so characteristic of the Truk region, is set off by the two types of strongyles and the rather characteristic shape of the microsclere.

The specific name is given in respect to the zoologist, Dr. R. W. Hiatt.

Hiattrochota mystile, new

Text Figure No. 79

This species is here represented by the following:

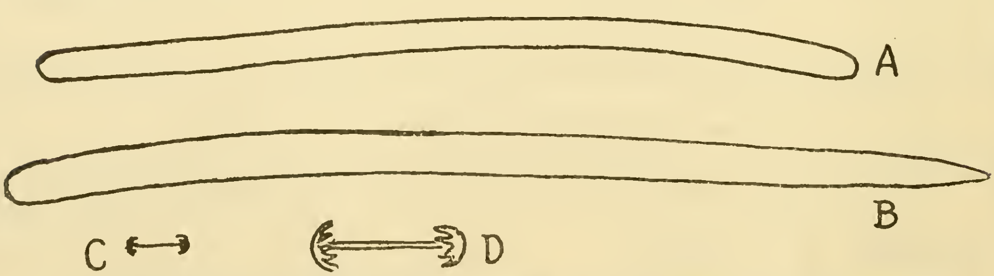
U.S.N.M. No. 23018, My No. M. 398, collected July 15, 1949, by diver at Likiep Atoll in the south part of the lagoon near Lukonwoerr Islet. The depth was 5 meters, and the substrate was dead coral. This species was very common in the Likiep Atoll.

U.S.N.M. No. 22894, My No. M. 194, collected August 10, 1949, by diver in the Truk lagoon near Moen Islet. The depth was 2 meters, and the substrate was dead coral.

This species is very thinly incrusting. Its vertical measurements were well under 1 mm. It spreads laterally indefinitely, often covering as much as 200 to 500 square cm.

The color in life was black, and the consistency softly colloidal. When one attempts to dislodge this species, one obtains latex-like strings rather than any more solid material.

The surface is extremely smooth and, of course, pores and oscules cannot be made out.



Text Figure No. 79. Spicules of *Hiattrochota mystile*. *A:* Strongyle from the ectosome, X 781. *B:* Style from the endosome, X 781. *C:* Amphidisc microsclere, X 781. *D:* Amphidisc, X 1,562 (oil immersion study).

The ectosome presumably includes a cellular layer, or dermis, but this is very inconspicuous. The endosome is densely filled with softly colloidal material and shows no other striking characteristics.

The skeleton consists of scattered spicules, not sharply divided into two categories but nevertheless to be so interpreted. The strongyles, which are about 3.5 μ by 225 μ to 6 μ by 140 μ, are somewhat more numerous in the outer region. The styles, which are about 5 μ by 157 μ to 8 μ by 170 μ, are more characteristic of the deeper layers. The microscleres are quite noteworthy. They are amphidiscs, or birotules, 12 μ in length, but of exceedingly thin shaft dimensions. The latter is definitely less than 1 μ thick. The heads also are small, only about 2 μ or 3 μ in diameter; and, partly because of the small size, teeth or clads cannot readily be discerned at their edges.

This species may be compared to *baculifera,* from which it differs in being black and smooth where *baculifera* is purple and conulose; and, in addition, there is the considerable difference in shape of the microscleres.

The specific name is derived from a Greek word for a bit of bread permeated by gravy or soup and refers to the very colloidal condition of this sponge.

GENUS *IOTROCHOPSAMMA,* new

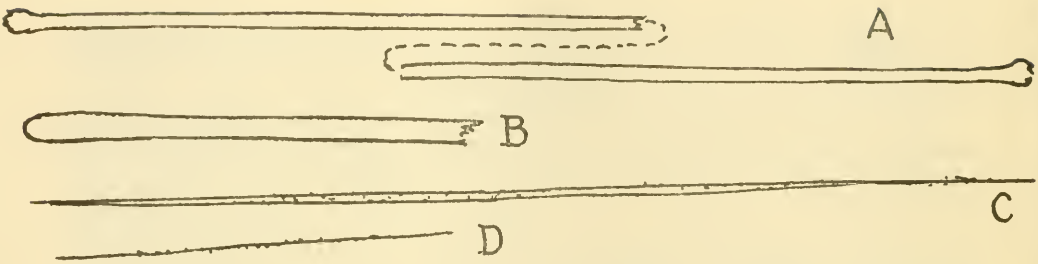
In 1906, page 482, Whitelegge described a sponge as *Iotrochota arbuscula* from Australia. Instead of black or purple, as most related sponges are, it was described as gray. It was ramose and contained microscleres 20 μ long and in many respects was typical of either *Iotrochota* or *Hiattrochota.* Other than these birotulate microscleres, however, no spicules were found. Instead, a considerable quantity of sand and other foreign material was present in the skeleton of this sponge. This constitutes such a great difference from other genera that it is considered worthy of being elevated to full generic rank. *Iotrochopsamma* has as type, and for the present as its only species, *arbuscula,* and may be defined as having a principal skeleton of sand accompanied by birotulate microscleres. The family allocation is puzzling. Because of the foreign material it would appear to belong in the family Psammascidae, but the obvious close relationship to *Iotrochota* and *Hiattrochota* is such that for the present it is left, with apologies, in the Myxillidae.

FAMILY TEDANIIDAE Ridley and Dendy
GENUS *TEDANIA* Gray
Tedania oligostyla, new

Text Figure No. 80

This species is here represented by the following:

U.S.N.M. No. 22970, My No. M. 346, collected July 5, 1949, by hand while



Text Figure No. 80. Spicules of *Tedania oligostyla*, X 781. *A:* Tylote from the ectosome; the entire spicule is shown, but in two parts. *B:* The head only of one of the rare endosomal styles. *C:* Larger microspined raphide. *D:* Microspined raphide.

wading at Ebon Atoll from the Pearl Pool in the western portion of the lagoon. The depth was low tide mark, and the substrate was dead coral.

The species was extremely common in this portion of Ebon Atoll.

The shape may be described as interstitial, because the sponge grew in spaces between fragments and masses of dead coral, extending indefinitely in all directions but not protruding to any great extent. In places there appear to be masses of the sponge as much as 10 cm in diameter, but these masses consist chiefly of dead coral with only a sort of cement or glue of the sponge tissue.

The color in life was bright red, but the endosome was definitely paler than the ectosome. The consistency was weakly spongy, very fragile.

The surface is smooth, but micro-punctiform, with pores which in life were more than 200 μ in diameter but which close upon dying. There are about two of these pores per each square mm. The oscules are very few, but as large as 8 mm in diameter and are characterized by a raised rim 2 to 4 mm high.

The ectosome is characterized by more densely protoplasmic structure and brighter color than the more cavernous endosome. The latter is somewhat like wet breadcrumbs, as is characteristic of the genus *Tedania.*

The skeleton includes very straight tylotes, 2.5 μ by 220 μ, with heads about 3 μ or 3.5 μ in diameter and faintly microspined on the apices. Such dermal spicules are fairly common in the genus *Tedania,* although it is to be expected that they would be strongyles rather than tylotes. In this *Tedania* from Ebon Atoll, such spicules instead of being confined to the ectosome are also very common in the endosome. Here one would expect to find smooth styles; and, after long and careful search, a few such were discovered, but they are very rare. They are 3.5 μ by 240 μ in measurement. The microscleres are quite typical of nearly every species of the genus *Tedania.* They are called onychaetes, and are essentially raphides, or microxeas, but very long. Dimensions in this specimen were 0.5 μ by 75 μ to 1.5 μ to 175 μ.

They are, as usual, covered with exceedingly minute spines, which require oil immersion for certain discovery. In the species *oligostyla* these spicules are exceedingly abundant, practically filling large quantities of the endosome of the sponge.

This species is sharply set off by the rarity of the styles. A little more and they would be gone entirely, and generic recognition would become exceedingly perplexing. Their place in forming the skeleton is taken in part by the dermal spicules and in part by the large size and abundance of those spicules which are usually merely supplementary microscleres.

The species name is from the Greek, for few styles.

Tedania ignis (Duchassaing & Michelotti) Verrill

Text Figure No. 81

This species is here represented by the following:

U.S.N.M. No. 22921, My No. M. 227, collected September 1, 1949, by diver at Iwayama Bay in Koror in the Palaus. The depth was 2 meters, and the substrate was dead coral.

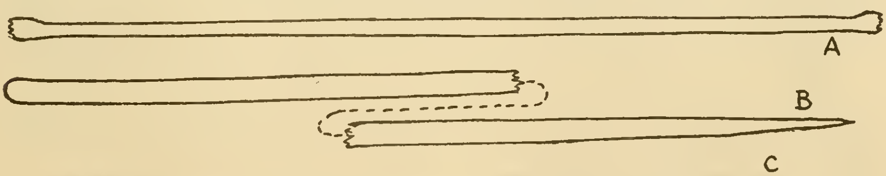
The shape, as in the case of *Tedania oligostyla,* is described as interstitial. The species was common, but it was difficult to dissect as much as a single cubic centimeter of only sponge.

The ectosome color in life was vermillion red, but the endosome was somewhat paler, what one might call salmon-red. The consistency was softly spongy. This species, as it occurs in other parts of the world, is notorious for giving rise to a skin irritation which is somewhat painful, itching, burning, and lasting for several days. The author obtained this same annoyance from the Palau specimens.

The surface is somewhat irregular but described as smooth. The pores close very readily, and the oscules are difficult to find, largely because of the extent to which the sponge is regularly hidden in the interstices of sticks of dead coral.

The ectosome is more densely protoplasmic than the endosome, which is "crumb-of-bread" or microcavernous in nature.

The skeleton consists of typical *Tedania* spicules. The dermal ones are rather more tylotes than strongyles, which is a little unusual; and they are



Text Figure No. 81. Spicules of *Tedania ignis,* X 781. *A:* Ectosomal tylote. *B:* Endosomal style; the entire spicule is shown, but in two parts. *C:* Microspined raphide.

definitely spined at their ends. Their dimensions are 3.5 μ by 225 μ. The spicules of the endosome are styles 5 μ by 245 μ to 6 μ by 260 μ. The microscleres are typical onychaetes 1 μ by 215 μ and smaller.

Typical *Tedania ignis* is a West Indian sponge, where it was first described as *Thalysias ignis* by Duchassaing and Michelotti, 1864, page 83. In the West Indies, young specimens are very much like those now under discussion, but the species very quickly grows up to massive size with conspicuous oscules. Therefore, this Koror specimen is identified with *ignis* with some hesitation. It gives ample evidence of being exactly the same species which occurs in the Hawaiian Islands and which has been identified as *Tedania ignis* by de Laubenfels, 1950, page 21, but as such has misgivings similar to those which are expressed here. Perhaps the Pacific Ocean specimens, both from the Palaus and the Hawaiian Islands, should be regarded as a *Tedania ignis* subspecies *pacifica.*

GENUS *TEDANDORYX,* new

This genus is erected in the family Myxillidae to have as genotype the following species, *Tedandoryx lissa.* The megascleres are very much like those in *Tedania.* There are dermal strongyles or tylotes. The endosomal spicules are smooth styles or subtylostyles. The microscleres include many which are strikingly like those of *Tedania,* with the exception that upon careful study they prove to be modified styles rather than modified oxeas. A further point of difference is the occurrence of isochelas of very peculiar shape. They may be regarded as arcuate, but they are far from being typical arcuate chelas.

The genus *Lissodendoryx* is characterized by having arcuate isochelas and lacks the onychaetes, but otherwise it resembles *Tedania.* The name here selected for this new genus is derived from the generic names *Tedania* and *Lissodendoryx.*

Tedandoryx lissa, new

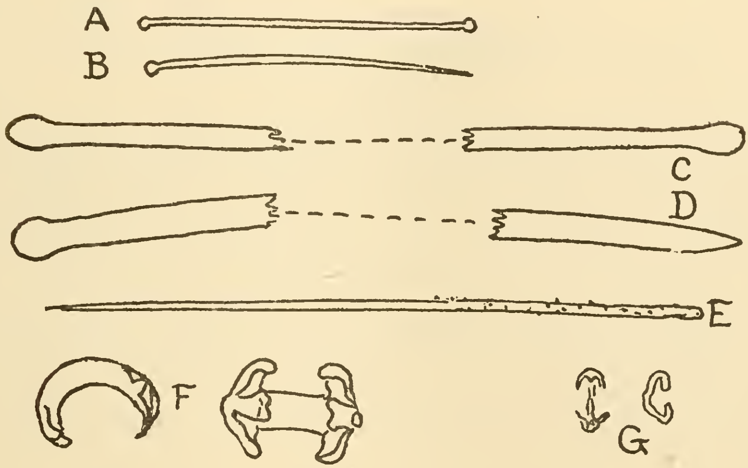
Text Figure No. 82

This species is here represented by the following:

U.S.N.M. No. 22906, My No. M. 211, here designated as type, collected August 13, 1949, by diver at Lemotol Bay in the west part of the Truk lagoon. The depth was 4 meters, and the substrate was dead coral.

The shape of this sponge may be described as amorphous. The diver reported a very large sponge but was able to detach only small fragments about 1 cm in cubic measurement.

The exterior color in life was carmine red; the interior vivid dark yellow. The consistency was soft.



Text Figure No. 82. Spicules of *Tedandoryx lissa*. *A:* Ectosomal tylote, X 182. *B:* Endosomal style, X 182. *C:* Terminations of the tylote, X 781. The central portion is not shown. *D:* Terminations of the style, X 781. The central portion is not shown. *E:* Partially spined microstyle, X 781. *F:* Larger isochela, X 781. Side view and front view are shown, but not of the same microsclere. Much variation in shape occurs. *G:* Smaller isochela, X 781. Front and side views are shown.

The surface is extremely irregular with no particular pattern. The pores were closed by the time specimens reached the surface, and the only indications of oscules are dubious. Perhaps the genuine oscules were closed.

The ectosome comprises a tangent layer of special spicules, and the endosome is chiefly confused, with some resemblance to crumb-of-bread or microcavernous structure.

The skeleton consists primarily of spicules with little or no spongin. The ectosomal megascleres are tylotes, 3 μ by 240 μ, with heads only slightly larger than the shafts. The megascleres of the endosome are smooth subtylostyles, again with heads only slightly larger than the diameter of the shafts. Their dimensions are approximately 5 μ by 240 μ. The flesh is crowded with microscleres which are faintly microspined, and strongly suggest those characteristic of the genus *Tedania,* but these are not equi-ended—being slightly larger at one end and blunt at that same end. Their dimensions are approximately 1.5 μ by 120 μ. There also are present isochelas of peculiar shape and two categories. A larger one is 25 μ in length, and a smaller one 10 μ to 11 μ in length. These are best described by an illustration, but it is pertinent to comment that the central wing is very small and the lateral wings at each end of the spicule are exaggerated and rather ear-shaped.

Comparisons of this species, as for example to the genera *Tedania* and *Lissodendoryx,* occur in the generic discussion above.

The species name is derived from a Greek word for "smooth."

GENUS *LISSODENDORYX* Topsent

Lissodendoryx oxytes, new

Text Figure No. 83

This species is here represented by the following:

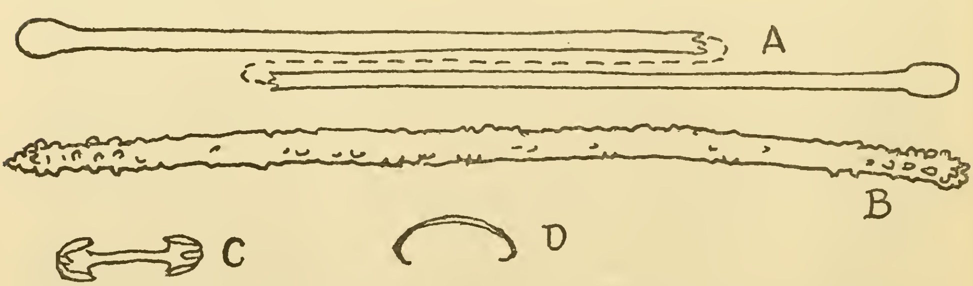
U.S.N.M. No. 22929, My No. M. 235, designated as type, collected September 2, 1949, by divers northwest of Koror in Komebail lagoon in the Palaus. The depth was 5 meters, and the substrate was dead coral.

Some bits of this species may be described as incrusting, and at such places it is less than 1 mm thick. The most characteristic matter in regard to its shape is its tendency to penetrate. The coral, where *oxytes* was found, was ramified by galleries which appeared to have been made by the sponge *Cliona.* Such is probably the case, because a few of these galleries did contain both spicules or actual fragments of living *Cliona.* However, the majority of these galleries, which were 1 to 2 mm in diameter and were ramifying through the calcareous material, were filled not with *Cliona* but with the species now under discussion. It is positively not suggested that the *Lissodendoryx* excavated these cavities; it merely penetrated them. Whether the *Cliona* died and left them first empty or whether the *Lissodendoryx* actually drove out the *Cliona* could not be ascertained. Annandale, 1915, pages 457 to 478, describes about a dozen other species of sponge which similarly invade the burrows of *Cliona.*

The color in life was extremely dark purple, but immediately upon placement in alcohol it changed to a flesh color. This color change is unexpected and quite novel. The consistency was slimy, softly colloidal.

The surface is shiny smooth, with no pores or oscules visible to the naked eye. They cannot be found in preserved specimens. The pores undoubtedly are closed.

There is little protoplasmic differentiation for ectosome, but special ectosomal-type spicules occur and may indicate the theoretical presence of such structure. The sponge is chiefly endosome, as might be expected from its occurrence in excavations.



Text Figure No. 83. Spicules of *Lissodendoryx oxytes,* X 781. *A:* Ectosomal tylote. The entire spicule is shown, but in two parts. *B:* Endosomal acanthostyle. *C:* Arcuate isochela. *D:* Sigma.

The skeleton consists, first, of ectosomal-type spicules as characteristic of the genus *Lissodendoryx.* These are smooth tylotes, 3 μ by 230 μ in dimensions. The endosomal spicules are acanthostyles, but the pointed end is so blunt that they give a brief impression of being acanthostrongyles. The ends are more spiny than the middle of these spicules, and the ornaments are more like small lumps than sharp spines. Their dimensions are approximately 5 μ by 165 μ. There are some typical arcuate isochelas, 25 μ long, as are expected in the genus *Lissodendoryx,* and abundant sigmas, 20 μ in chord length, also as typical of this genus. There are in addition abundant trichodragmas, 0.3 μ by 35 μ in measurement. This is not expected in this genus.

The species *oxytes* is set apart by a number of characteristics: the trichodragmas, the distinctive purple color, and most of all its tendency to penetrate.

The specific name is derived from a Greek word meaning "penetration."

Lissodendoryx calypta, new

Text Figure No. 84
Plate VIII, Figure b

This species is here represented by the following:

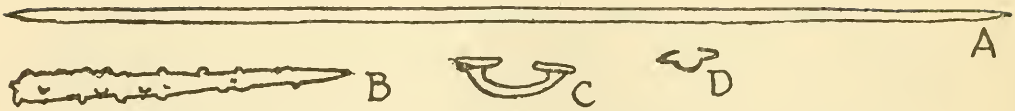
U.S.N.M. No. 22806, My No. N. 011, here designated as type, collected on June 5, 1946, by W. R. Taylor at Eniwetok Atoll in the lagoon 8 kilometers north of the south anchorage by dredging at a depth of 35 meters. This was near the very center of the lagoon and is in U.S.N.M. accession No. 172224.

This remarkable sponge is a paper-thin incrustation which covers about nine-tenths of the total surface of a handful of branches of the keratose sponge *Thorectopsamma mela.* The covered sponge seems to have been none the worse for its clothing. Its branches are about 1.5 cm in diameter and project only about the same distance beyond their envelope at their growing tips. Evidently the *Lissodendoryx* grew about as fast as they and was thin enough to permit ready passage of water through itself to the underlying sponge.

The color in alcohol is pale, the consistency is like cloth, but it is easily torn. The surface is smooth and lipostomous.

The sponge is extremely thin, so that there is no distinct separation as to ectosome and endosome, although the skeleton comprises spicule categories typical of the two locations.

The skeleton consists of two sorts of megascleres and at least two sorts of microscleres. The former comprise, first, hastate tornotes of the sort which often characterize ectosomes and which are about 2 μ by 170 μ and, second, acanthostyles, as to be expected in endosomes; these latter are 4 μ by 60 μ to 6 μ by 90 μ. There are arcuate isochelas of commonplace shape and of



Text Figure No. 84. Spicules of *Lissodendoryx calypta*, X 781. *A:* Ectosomal tornote. *B:* Endosomal acanthostyle. *C:* Larger isochela. *D:* Smaller isochela.

two distinct size ranges—the larger 22 μ and the smaller only 10 μ long. I was unable to find any sigmas or other microscleres.

This species is set off by its distinctive shape. Very few species of *Lissodendoryx* lack sigmas; very few have the endosomal styles covered with spines. None has the peculiar combination found in *calypta.*

The species name is derived from the Greek verb "to envelop," referring to the strange habitus of this sponge.

FAMILY PSAMMASCIDAE de Laubenfels
GENUS *PSAMMASCUS* Marshall
Psammascus ceratosus (Kirkpatrick) de Laubenfels

Text Figure No. 85

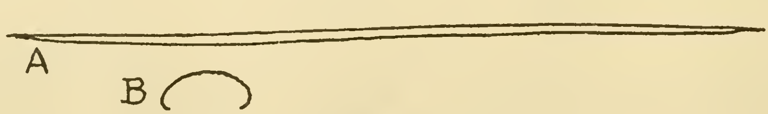
This species is here represented by the following:

U.S.N.M. No. 22893, My No. M. 193, collected August 3, 1949, by diver in western Ponapé near Tavak passage from a reef barely inside the lagoon. The depth was 3 meters, and the substrate was dead coral.

The shape of this species is incrusting. The specimens from Ponapé are less than 1 mm thick; but they give the superficial appearance of representing an enormous ramose sponge, because they completely cover a large bush of dead coral of the sort known as "elkhorn" (probably *Acropora*).

The color in life was a dull rose pink, with a distinctive opaque appearance, due to the presence of much sand in the ectosome. The endosome in contrast was bright vermillion and more nearly translucent. The consistency was colloidal, the sponge being held together chiefly by its dermis. The interior was a decidedly soft sol.

The surface is fundamentally smooth, but marked by very conspicuous grooves, which are often about 2 or 3 mm apart and 4 or 5 mm to 15 or 20 mm long, undulating and occasionally branched but not arranged in definite river-system patterns. The pores apparently are arranged along these



Text Figure No. 85. Spicules of *Psammascus ceratosus,* X 781. *A:* Oxea. *B:* Sigma.

grooves, about 2 or 3 pores per mm. Definite exhalant openings or oscules could not be established.

The ectosome is very sharply set off and easily detached. It is characterized by color and is packed with detritus. The endosome contains foreign material but not to so large an extent. The spicules in it are chiefly arranged in confusion.

The skeleton, other than the foreign material (especially sand) comprises smooth oxeas, 2 μ by 130 μ, and small sigmas, 15 μ in chord length.

This species was first described as *Chondropsis ceratosus* by Kirkpatrick, 1900, page 355, from the East Indian region. It was transferred to *Psammascus* by de Laubenfels, 1936, page 99. It bears considerable resemblance to a sponge which was described as *Phoriospongia canaliculata* by Lendenfeld, 1889, page 602, from the Australian region. The latter, however, is lobose to frondose, whereas *ceratosus* is incrusting. These Ponapé specimens obviously had every incentive to be ramose, yet the sponge showed no tendency to grow in that direction but merely to spread indefinitely as a thin crust. An interesting suggestion occurs; namely, that Lendenfeld's specimen might have been similarly incrusting over some substratum which he did not notice. In this case, the later name *ceratosus* would have to fall in synonymy to the earlier name *canaliculata.* This step is not taken at the present time.

FAMILY MICROCIONIDAE Hentschel

GENUS *THALYSIAS* Duchassaing & Michelotti

Thalysias cervicornis (Thiele) de Laubenfels

Text Figure No. 86

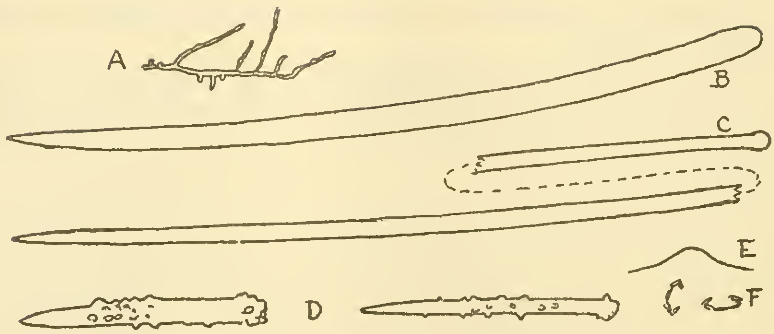
This species is here represented by the following:

U.S.N.M. No. 22892, My No. M. 192, collected August 3, 1949, by diver in western Ponapé at Jokas near Tavak passage from a reef barely inside the lagoon. The depth was 8 meters, and the substrate was dead coral. This species was very abundant in this vicinity.

U.S.N.M. No. 22905, My No. M. 209, collected August 13, 1949, by diver in the west part of Truk lagoon, specifically at Lemotol Bay. The depth was 2 meters and more, and the substrate was dead coral. The species was very abundant in this vicinity.

The shape is sprawling ramose. The diameter of the branches is 6 to 10 mm. The length is often 30 cm and in some cases as much as 70 cm. The branching is very peculiar. Considerable areas have no branches, and when they occur they may be at right angles. Numerous extremely short branches, some of which are scarcely more than tall conules, are also found in places.

The ectosome and endosome color in life in the specimens in Ponapé



Text Figure No. 86. *Thalysias cervicornis. A:* Sketch of the entire sponge, X 1/15. This is NOT a camera lucida drawing. *B:* Style from the fiber. *C:* Tylostyle from the spaces between fibers, and from the ectosome. The entire spicule is shown, but in two parts. *D:* Two of the echinating acanthostyles. *E:* Toxa. *F:* Two of the palmate isochelas, each in side view. *B-F,* X 781.

may be described as pale brownish orange, or flesh color. In contrast, those from Truk are a little duller on the exterior, which may be described as caramel color, but brilliant vermillion on the interior. It is possible that they represent two species, but agreement in other respects is sufficiently great that this differentiation is not here proposed. The consistency was tough, elastic, and horny, owing to the nature of the fibers. The flesh was very soft in contrast to the skeleton.

The surface is smooth, or micro-velvet, being covered by myriads of slightly projecting erect spicules. The pores are probably located in the ceiling of the obvious subdermal canals, which meander about over the surface of this sponge, but close very quickly and do not show in the specimen. The same is true of the oscules in the Ponapé specimen. In contrast, in the Truk specimen, definite oscules, 3 to 5 mm in size, were noticed in the field. This is not regarded as of any real significance in separating the Truk and Ponapé specimens, because these oscules were phenomenally rapid in closing—even those as much as 5 mm in diameter would close in less than one second's time and could be observed only in an absolutely undisturbed specimen under water. I do not know of any other instance of quite such extremely quick movement in any other species of sponge.

The ectosome differs both in color and in density from the endosome, but the difference is not great.

The skeleton consists of a reticulation of fibers of tough spongin, 60 μ to 200 μ in diameter, with a very fine mesh—the meshes in many cases being smaller in diameter than the diameter of the fibers. The latter are crowded with spicules in plumose arrangement. The principal or coring spicules are tylostyles, 4 μ by 265 μ in dimensions. The Truk specimen also contained a few others which are not tylostylote and are shorter and thicker, 7 μ by

194 μ. There are abundant echinating acanthostyles, 4 μ by 66 μ to 6 μ by 63 μ. The microscleres are not common but do include distinctive palmate isochelas, 10 μ in length, with very narrow shovels and toxas about 40 μ to 50 μ long.

This species was first described as *Raphidophlus cervicornis* by Thiele, 1903, page 959, from the East Indian region.

Thalysias cratita (Esper) de Laubenfels

Text Figure No. 87

This species is represented by the following:

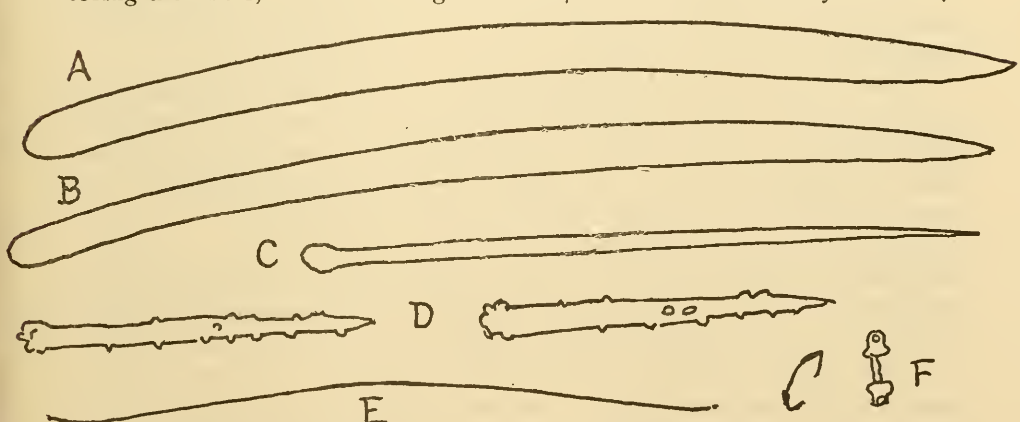
U.S.N.M. No. 23029, My No. M. 408, collected July 30, 1949, by diver in northwest Ponapé, between the reef and the shore. The depth was 5 meters, and the substrate was dead coral.

The shape is typically ramose, with branches 15 mm in diameter and 15 cm high. The exterior and interior color in life was pinkish red, and the consistency was stiffly spongy.

The surface is conulose, with conules, 3 mm high and 3 mm apart, having rounded terminations. The pores and oscules are quickly closing. They are not visible at the present time, nor is there any record of them in the field. The surface is lipostomous.

The ectosome is packed with spicules pointing in many directions but chiefly towards the outside. The endosome has a reticulation of horny fibers, and it also contains abundant spicules.

The skeleton comprises, first of all, smooth styles which are inside or coring the fibers, the latter being about 80 μ in diameter. The styles are 6 μ



Text Figure No. 87. Spicules of *Thalysias cratita*, X 781. *A* and *B:* Two of the styles from the fiber. *C:* One of the tylostyles as from between fibers, and as from the ectosome. *D:* Two of the echinating acanthostyles. *E:* Toxa. *F:* Palmate isochela, side and front views.

by 166 μ to 7 μ by 170 μ. Loose in the flesh and at the surface are many small smooth tylostyles, 3 μ by 117 μ in dimensions. The fibers are echinated by acanthostyles, which are about 4 μ by 64 μ. The microscleres include palmate isochelas 13 μ long, and in this species they have shovels of rather peculiar shape. In addition, there are very numerous microscleres which are between toxas and raphides in shape. They are only slightly more than 1 μ in diameter and upwards of 115 μ long. Some are nearly straight, and some are twice or three times bent. The shape of a toxa is thereby approximated. This type of microsclere is very distinctive of the species *cratita*.

This sponge was first described as *Spongia cratita* by Esper, 1794 circa, page 188, from the East Indies and designated as type of the genus *Raphidophlus* by Ehlers, 1870, page 18. A discussion of the genus *Thalysias* by de Laubenfels, 1936, page 104, may be taken as the first transfer of this species (and of the genus *Raphidophlus*) to the earlier *Thalysias*.

Thalysias frondifera (Bowerbank) de Laubenfels

Text Figure No. 88

This species is here represented by the following:

U.S.N.M. No. 23149, My No. M. 533, collected September 22, 1949, by diver at Agana Bay on the northwest coast of Guam. The depth was 2 meters, and the substrate was dead coral.

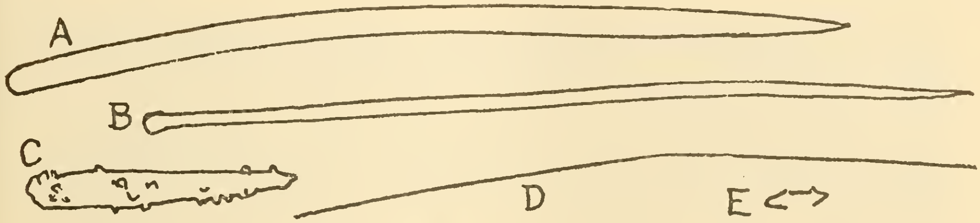
The shape is irregularly massive with lobes which are large in proportion to the basal region. A maximum height of at least 17 cm was reached in Guam.

The color in life was orange, obscured by a considerable amount of foreign debris which covered the surface. The endosome was definitely paler than the exterior. The consistency was stiff and wood-like.

The surface is multiple tuberculate, with smaller tubercles on larger ones of all sizes. The pores and oscules could not be made out, partly because of the extremely irregular surface. There were small holes here and there, but it was impossible to be sure whether they were actual oscules, or accidents, or perhaps merely deep grooves in the rough surface.

The ectosome is characterized by a fairly large number of spicules, erect, with their points outward; and it was covered by a considerable amount of debris. The interior is characterized by a fibro-reticulation, but one which is very vague. In such cases it is not practical to cite diameters of fibers.

The skeleton consists of three types of megasclere and two types of microsclere. The spicules which core the fibers, or make up the masses of spicules which predominate, are smooth styles, about 5 μ by 145 μ. Some are at least 11 μ thick, but such were broken so that their total length is not known. Other spicules occur at the surface, and in the spaces between the masses or bundles of styles. The latter are smooth tylostyles, 2 μ by 150 μ



Text Figure No. 88. Spicules of *Thalysias frondifera*, X 782. *A:* Style from the fiber. *B:* Tylostyle, as between fibers and at the surface. *C:* Echinating acanthostyle. *D:* Raphide or toxa? *E:* Palmate isochela, side view.

to 3 μ by 150 μ. There are echinating spicules present, acanthostyles 6 μ by 46 μ. The microscleres include raphides 1 μ by 60 μ to 0.5 μ by 120 μ. Some of these are slightly bent, indicating a little approach in the direction of being toxas. There are also palmate isochelas only 10 μ long, and with very narrow shovels.

This species was described first as *Halichondria frondifera* by Bowerbank, 1875, page 288, from the East Indian region. Specimens much more like this one from Guam later were described by Dendy, 1889, page 85, as *Clathria corallitincta.* These came from the Indian Ocean. Burton and Rao, 1932, page 337, drop *corallitincta* in synonymy to *frondifera,* and their action is here followed, but with some question.

GENUS *CLATHRIA* Schmidt

This genus has undergone numerous vicissitudes of such a nature that some discussion of them is here warranted.

It was established by O. Schmidt, 1862, page 57, at once containing two species. One of these had been first described as *Spongia coralloides* by Olivi in 1792. This was definitely described by Schmidt as being a sponge with fibers cored with smooth styles and echinated by smooth styles. Vosmaer, 1885, page 356, discussed the genus and speaks of *corralloides* as the "beispiel" or example thereof, and this has widely been considered a genotype designation. Actually, according to the International Rules of Zoological Nomenclature, it is not such. On the basis of published descriptions, *coralloides* is definitely of the genus *Ophlitaspongia,* and de Laubenfels, 1936, page 122, therefore dropped the genus *Clathria* into synonymy to *Ophlitaspongia.*

At the time he established the genus, Schmidt also placed in it a second species, which he called *Clathria compressa;* this was on page 58 of his 1862 treatise. In this place it is described very briefly and is quite unrecognizable. However, Schmidt and others began referring to *Clathria* sponges characterized by fibers cored with smooth styles, but echinated with acanthostyles. The

present author, subsequent to publication of the above-mentioned 1936 monograph of the phylum Porifera, discovered that Schmidt had himself in 1864, page 35, officially designated *compressa* as type of the genus *Clathria*. Now if *compressa* really did have acanthostyles as echinating spicules, the subsequent actions of Schmidt would be intelligible and give genuine justification for the actions of those other authors who have often referred such species to the genus *Clathria*. Not before, but after most of such allocations had been made, Topsent, 1925, page 647, described material which he said had been identified by Schmidt as being *Clathria compressa*, and Topsent's description includes echinating acanthostyles. Since it turns out that *compressa* and not *coralloides* is the type, this is very interesting. Had Topsent designated some of the material which he had for description as neotypes of the genus, it would certainly be advisable to revive *Clathria* for the specimens with echinating acanthostyles. Although this action was not definitely taken, it is here considered advisable to resume using *Clathria* for the type of sponge which by many authors in the past has been referred to this genus.

Clathria fasciculata Wilson

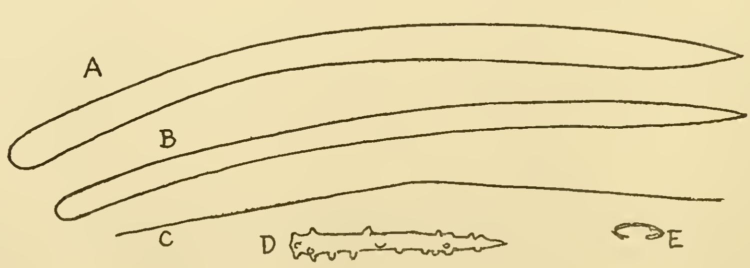
Text Figure No. 89

This species is here represented by the following:

U.S.N.M. No. 22910, My No. M. 215, collected August 13, 1949, by diver in the west part of the Truk lagoon, specifically at Lemotol Bay. The depth was 4 meters, and the substrate was dead coral.

U.S.N.M. No. 22920, My No. M. 226, collected September 1, 1949, by divers in Iwayama Bay near Koror in the Palaus. The depth was 2 meters, and the substrate was dead coral.

The shape of many specimens is clavate; but when branches occur, as often is the case, the term ramose is indicated. The cylindrical portions are usually 2 to 3 cm in diameter, and a vertical measurement of at least 30 cm is reached.



Text Figure No. 89. Spicules of *Clathria fasciculata*, X 782. *A* and *B*: Styles. *C*: Raphide or toxa? *D*: Echinating acanthostyle. *E*: Palmate isochela, side view.

The exterior color in life was gray to dull drab, but the endosome varied from dull rosy pink to dull red. The consistency was stiffly spongy.

The surface is conulose with conules 2 to 3 mm high and 3 mm apart. The pores were all closed during the process of collection. Oscules often are missing, but in a few specimens they were noticed before they closed. They seemed as much as 3 mm in diameter and 2 to 4 cm apart. In life they are often very conspicuous, and it may be noticed that they branch immediately below the surface into relatively large diverging canals.

The ectosome is characterized by a concentration of protoplasmic material but has no sharp termination. It blends into the endosome. The endosome is permeated by crude, or irregular shaped, fibers and does not consist of a neat network.

The skeleton consists of abundant smooth styles which are united, and in some cases are encased by a certain amount of spongin. These vary in size from 5 μ by 180 μ to 13 μ by 228 μ. In fact, a very few are even as small as 2.5 μ by 92 μ. The latter are almost certainly developmental forms, however. The echinating spicules are acanthostyles with rather large, blunt spines. Total spicule dimensions are 4 μ by 56 μ to 7 μ by 56 μ. The microscleres include filiform toxas, 0.5 μ by 150 μ, and palmate anisochelas, 13 μ to 14 μ in length.

This species was described as *Clathria fasciculata* by Wilson, 1925, page 442, from the Philippines.

Clathria abietina (Lamarck) de Laubenfels

Text Figure No. 90

This species is here represented by the following:

U.S.N.M. No. 23090, My No. M. 472, collected August 13, 1949, by diver in the western portion of the Truk lagoon in Lemotol Bay. The depth was 4 meters, and the substrate was dead coral.

U.S.N.M. No. 22808, My No. N. 014, collected June 5, 1946, by W. R. Taylor at Eniwetok Atoll in the center of the lagoon, 8 kilometers north of the south anchorage. This was dredged at a depth of 35 meters.

This species is exceedingly irregular in shape. The specimen from Truk was 4 cm in diameter and 14 cm high.

The color in life was a brown which may be described as caramel. Most of the interior was rather dull colored. About 1 mm below the surface and extending around the entire sponge was a subcutaneous layer of fairly bright red color. This is a definitely unusual characteristic. The consistency was stiffly spongy.

The surface may be said to be conulose, with conules 2 mm high and 4 mm apart; but these conules are placed upon projections which might be described as super-conules so that the whole sponge has, as noted above, an

Text Figure No. 90. Spicules of *Clathria abietina,* X 781. *A:* Style. *B:* Acanthostyle. *C:* Two of the toxas. *D:* Palmate isochela, side view.

extremely elaborate structure. The pores are about 150 μ in diameter and about 400 μ apart, center to center. The oscules are 2 mm in diameter and are about 2 to 7 cm apart.

The ectosome in general is merely fleshy, as characteristic of the genus *Clathria,* but the tips of the conules are packed with spicules, which suggests the genus *Thalysias.* These spicules are, however, like those in the endosome and not a special type. They are not substylotylote or tylostylote; hence the genus *Clathria* seems to be warranted. The endosome is a definite fibro-reticulation with fibers, 50 μ in diameter, outlining rounded meshes, 100 μ to 300 μ in diameter. These fibers are packed with spicules and also are echinated.

The skeleton is characterized principally by megascleres which are smooth styles, 6 μ by 200 μ. In addition, there are occasionally echinating acanthostyles, 3 μ by 54 μ in dimensions. The spines are small. The microscleres include abundant toxas of rather typical shape, varying from 55 μ to 140 μ in length, and there are small palmate isochelas, only 10 μ long, with very narrow shovels.

Identification of this sponge is quite dubious and points up the difficulty of discriminating between *Clathria* and *Thalysias.* Lamarck, 1814, page 450, described a sponge from unknown locality as *Spongia abietina* Topsent, 1932, page 115, redescribed Lamarck's specimen, and assigned it to the genus *Raphidophlus,* which is a complete junior synonym of *Thalysias.* This specimen from Truk (dubiously) is identified with *abietina,* because of the great resemblance of external form and because the spicules differ only a little. Yet inasmuch as they differ at all, the Truk specimen is a *Clathria* rather than a *Thalysias.* Furthermore, since Lamarck's specimens were dry, no data were available as to the presence or absence of the peculiar red subdermal layer. It is decidedly possible that the specimen here discussed, No. M. 472, is not only a different species from *abietina* but even a different genus. It is obvious that a complete revision of the genera *Thalysias* and *Clathria* is needed and should be based (if at all possible) upon study of actual type specimens. Under such circumstances it is sometimes advisable to give a new name to a possibly new species, but there are so very many names already cluttering up the literature of these two genera that such action is not here taken.

GENUS *DICTYOCIONA* Topsent
Dictyociona eurypa, new

Text Figure No. 91

This species is here represented by the following:

U.S.N.M. No. 22922, My No. M. 228, here designated as type, collected September 1, 1949, by diver from Iwayama Bay near Koror in the Palaus. The depth was 2 meters, and the substrate was dead coral.

This species is incrusting, about 4 mm thick. It was very common in this vicinity and completely covered a huge dead coral head.

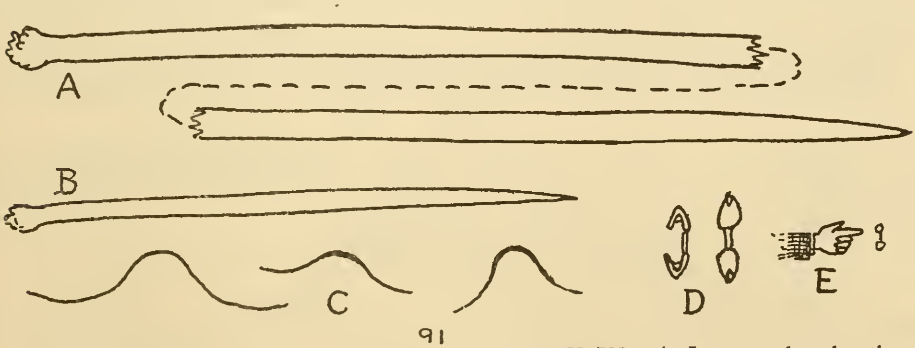
The color in life was a peculiar brown, like that of coffee with milk. This was true of both the interior and exterior. The consistency was soft.

The surface is smooth. The pores are about 70 μ in diameter and only 120 μ apart. The oscules are 7 mm in diameter and 12 mm apart, characterized by a raised rim about 1 to 3 mm high around each oscule.

The ectosome is densely protoplasmic and blends into the very fleshy endosome. The spicules at the surface are erect and bristling but elsewhere are in considerable confusion.

The skeleton consists of subtylostyles with heads lightly spined. These vary from 4 μ by 115 μ to 6 μ by 290 μ in dimensions. The microscleres include very numerous typical, strongly bent toxas, 30 μ to 54 μ in length. A single filiform toxa was discovered, 0.3 μ by 120 μ. This is probably foreign. There are two types of palmate isochela present: the larger ones 19 μ long and the smaller ones only 4 μ long.

The species *eurypa* is distinctive for its peculiar color. The only other *Dictyociona* with megascleres very much like those of *eurypa* was described as *Eurypon acanthotoxa* by Stevens, 1916, page 238, from deep water near Ireland. Stevens also described a species as *microchela,* but its chelas were not nearly so small as these amazingly small ones of *eurypa.* On the other



Text Figure No. 91. Spicules of *Dictyociona eurypa,* X 782. *A:* Larger tylostyle; the entire spicule is shown, but in two parts. *B:* Smaller tylostyle. *C:* Three of the toxas. *D:* Palmate isochela of normal size, side and front views. *E:* Phenomenally small palmate isochela.

hand, de Laubenfels, 1930, page 27, described from California a species as *asodes,* which has palmate isochelas as small as only 3 μ long. The single filiform toxa found in *eurypa* at first appears to be foreign, but it is noteworthy that Stevens, 1916, page 239, describes from Ireland a species as *Eurypon ditoxa* which had both filiform and typical toxas. Most of the species now in *Dictyociona* were originally described in *Eurypon.* Apparently, it is characteristic of *Dictyociona* that some of the species may have excessively small chelas, and others may have two types of toxa.

The species name *eurypa* is altered from *Eurypon* and signifies the partial resemblance of this sponge to those in the genus *Eurypon.*

GENUS *MICROCIONA* Bowerbank

Microciona plinthina, new

Text Figure No. 92

This species is here represented by the following:

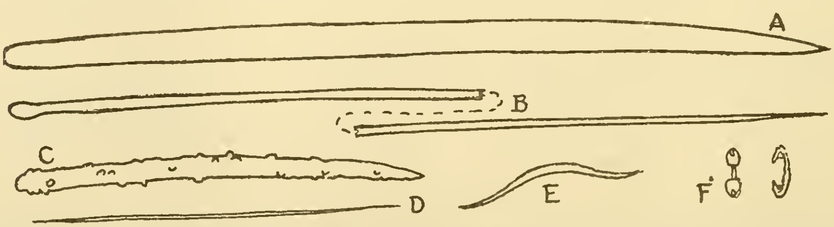
U.S.N.M. No. 22949, My No. M. 322, here designated as type, collected June 24, 1949, by diver at Ailing-lap-lap Atoll in the northeast corner of the lagoon near Jih Islet. The depth was 5 meters, and the substrate was dead coral.

This species is incrusting, less than 1 mm thick, and spreading indefinitely in all directions.

The endosome and ectosome color in life was brick red, and the consistency was slimy.

The surface is smooth and lipostomous.

The skeleton consists of megascleres, chiefly erect, with heads close to the substratum and their points towards the surface. These comprise smooth styles, 7 μ by 210 μ, and smooth tylostyles, 2.5 μ by 240 μ. There are also spicules of the echinating type; these are acanthostyles 6 μ by 105 μ. These types are all abundant, and so are all the types of microscleres. The latter include raphides, 1 μ by 100 μ, exceedingly sharp pointed at each end. Typical toxas, 50 μ long; and typical palmate isochelas, 15 μ long, also occur.



Text Figure No. 92. Spicules of *Microciona plinthina,* X 782. *A:* Style. *B:* Tylostyle; the entire spicule is shown, but in two parts. *C:* Acanthostyle. *D:* Raphide. *E:* Toxa. *F:* Palmate isochela, front and side views.

The species *plinthina* is unique within the genus *Microciona* for its raphides.

The name selected is derived from the Greek word for "brick."

Microciona micronesia, new

Text Figure No. 93

This species is here represented by the following:

U.S.N.M. No. 22833, My No. M. 111, here designated as type, collected June 28, 1949, by diver at Majuro Atoll near the east end of the lagoon in the vicinity of the islet called Rita or Jarej. The depth was 4 meters, and the substrate was dead coral.

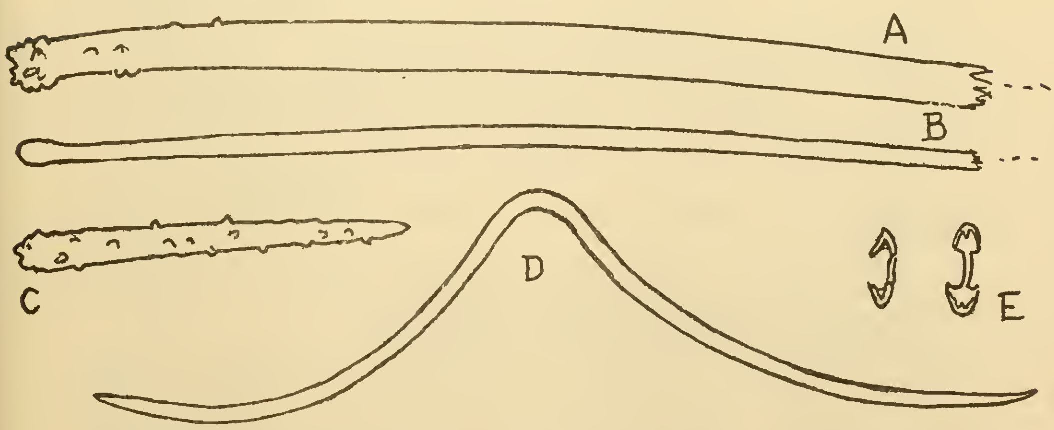
This species is a thin crust, about 1 mm thick, spreading laterally at least 4 cm.

The exterior and interior color in life was medium red, and the consistency was mediocre.

The surface is smooth and lipostomous, characteristic of very thin incrusting sponges.

The ectosome and endosome are not sharply marked off from each other, as usual in sponges as thin as this, but the surface does show a number of spicules with points outward.

The skeleton of this species consists of large tylostyles, 9 μ by 200 μ, the heads of which are only slightly enlarged but are rendered quite lumpy by blunt spines. There are also smooth tylostyles, 3.5 μ by 200 μ, and completely acanthose echinating styles, 5 μ by 70 μ. The microscleres include abundant typical palmate isochelas, 14 μ to 16 μ long, and a few enormous



Text Figure No. 93. Spicules of *Microciona micronesia,* X 782. *A:* Basal portion of one of the longer styles. *B:* Basal portion of one of the tylostyles. *C:* Echinating acanthostyles. *D:* Toxas. *E:* Two palmate isochelas, one in side view, one front view.

toxas, 3 μ thick and 170 μ long. These are three times curved, as is typical of toxas.

The species *micronesia* is regarded as sharply characterized by its typically shaped, but enormous, toxas. The species that was first described as *Clathria toximajor* by Topsent, 1925, page 653, from the Mediterranean, has toxas, 300 μ to 900 μ long, but these have a very peculiar shape, being practically straight spicules with one little curve in the center. This curve is of such a nature that each of the two long lateral projections is in line with the other. The sponge described as *Microciona microjoanna* by de Laubenfels, 1930, page 27, from California, has typical toxas, some of which were as large as 140 μ; but all of its spicules were enormous, the megascleres being as large as 27 μ by 330 μ.

The species originally described as *Microciona dives* by Topsent, 1891, page 543, has anchorate chelas. The dermal spicules are diactinal tornotes. This is obviously not a *Microciona* and therefore is transferred to the genus *Myxilla*.

The species described as *Microciona bulboretorta* by Carter, 1880, page 465, has no microscleres at all. It therefore is transferred to the genus *Epicles*.

The species described as *Microciona longispiculum* by Carter, 1876, page 237, from deep water in the Atlantic Ocean, has no microscleres and therefore is transferred to the genus *Epicles*.

The species name is given in honor of Micronesia, which is the anthropological term for that portion of the world which is discusssed in the present treatise.

Microciona placenta (Lamarck) de Laubenfels

Text Figure No. 94

This species is here represented by the following:

U.S.N.M. No. 22908, My No. M. 213, collected August 13, 1949, by diver in the west part of the Truk lagoon, specifically at Lemotol Bay. The depth was 4 meters, and the substrate was dead coral.

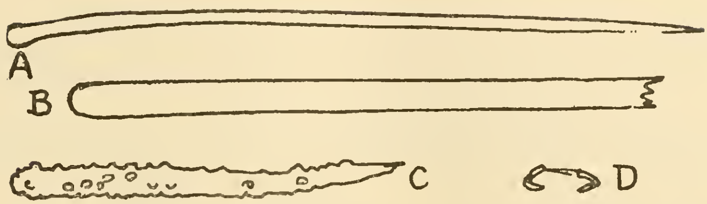
This species is incrusting, 1 to 2 mm thick, and spreading laterally at least 10 cm.

The exterior and interior color in life was olive drab, and the consistency was that of a colloidal jell.

The surface is extremely smooth and lipostomous.

The ectosome is not sharply separated from the endosome, the species being so very thin.

The skeleton consists of colloidal material and spicules which principally are erect with bases next to the substratum and points outward. These are smooth styles, varying towards being smooth subtylostyles. The size is 2 μ



Text Figure No. 94. Spicules of *Microciona placenta,* X 782. *A:* Tylostyles. *B:* Basal portion of one of the styles. *C:* Echinating acanthostyle. *D:* Side view of one of the isochelas.

by 122 μ to 5.5 μ by 270 μ. There also are echinating spicules which are acanthostyles, 5 μ by 67 μ. These are not common. Microscleres consist of palmate isochelas 13 μ long and also are relatively uncommon.

Lamarck, 1814, page 374, described *Spongia placenta* from the Australian region, and Topsent, 1931, page 24, refers it to the genus *Wilsonella,* redescribing it capably. The genus *Wilsonella,* however, is characterized by having arcuate rather than palmate isochelas, and the species *placenta* therefore is transferred to *Microciona.* Agreement of this specimen from Truk with the Australian species is remarkably close, to judge from published descriptions, although Lamarck's specimen grew to somewhat lamellate shape.

GENUS *ANAATA* de Laubenfels

Anaata lajorei, new

Text Figure No. 95

This species is here represented by the following:

U.S.N.M. No. 22827, My No. M. 102, here designated as type, collected June 11, 1949, by hand while wading at Ailing-lap-lap Atoll in the lagoon near Bikájela Islet in the southern portion of the atoll. The depth was just below low tide mark, and the substrate was dead coral.

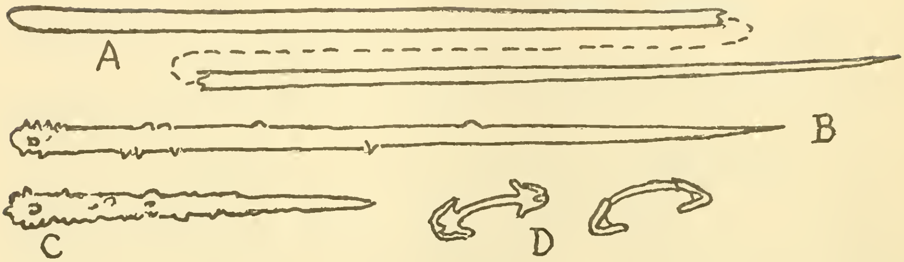
This is an incrusting species, measuring less than 1 mm thick and spreading laterally indefinitely.

The ectosome and endosome color in life was black, and the consistency mediocre.

The surface is smooth and lipostomous.

There is no sharp differentiation between ectosome and endosome.

The skeleton consists principally of large smooth styles placed with their bases towards the substratum and their points outward, 2 μ by 220 μ to 3 μ by 240 μ in dimensions. Among them, probably to be regarded as echinating, are acanthostyles, 3 μ by 135 μ to 4 μ by 80 μ. The smaller they are, the more they are completely spined. The larger ones are spined chiefly near the head. The microscleres consist of arcuate isochelas, 20 μ long.



Text Figure No. 95. Spicules of *Anaata lajorei,* X 782. *A:* Style; the entire spicule is shown, but in two parts. *B:* Intermediate type, between *A* and *C*. *C:* Echinating acanthostyle. *D:* Two of the arcuate isochelas; one front view, one in side view.

The species *lajorei* is set off quite sharply by its black color; furthermore, most species in *Anaata* have tylostyles in addition to the styles. The genus is very close to *Wilsonella,* but typical *Wilsonella* species also have diacts or quasidiacts.

The specific name here selected is given in respect to the native chieftain of the atoll called Ailing-lap-lap.

FAMILY OPHLITASPONGIIDAE de Laubenfels

GENUS *AXOCIELLA* Hallman

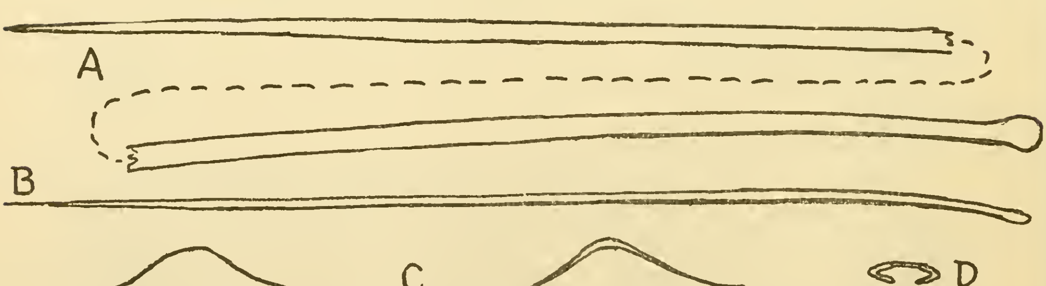
Axociella arteria, new

Text Figure No. 96

This species is here represented by the following:

U.S.N.M. No. 22876, My No. M. 173, here designated as type, collected July 30, 1949, by diver in northwest Ponapé between the reef and the shore. The depth was 5 meters, and the substrate was dead coral. This species was very common in the region of northwest Ponapé.

The shape of this species is attenuate ramose. The diameter is only 6 mm, and a vertical length of 60 cm commonly was reached. In all this



Text Figure No. 96. Spicules of *Axociella arteria,* X 782. *A:* Longer tylostyle; the entire spicule shows, but in two parts. *B:* Smaller tylostyle. *C:* Two of the toxas. *D:* Isochela.

only two branchings occurred, one of them near the tip of one of the two first branches.

The color in life was dull dark red, and the interior was somewhat paler than the exterior. The consistency was extremely spongy.

The surface was more or less smooth and lipostomous, but it is here considered probable that pores and oscules closed very quickly at the time of collection.

The ectosome and the endosome are separated chiefly by a color difference, but the ectosome is somewhat more dense in structure. The endosome is characterized by a fibro-reticulation.

The skeleton consists of fibers of yellow transparent spongin with scattered spicules inside them. The fiber diameter is about 120 μ, and the meshes are of very irregular size, often as much as 600 μ in diameter. The spicules consist of smooth tylostyles, 2 μ by 180 μ to 4 μ by 320 μ in dimensions. The microscleres comprise typical toxas, 50 μ to 65 μ long, and palmate isochelas 12 μ long.

No other species in the genus *Axociella* has such an extremely attenuate shape, and most of them have very much larger spicules. Others have smaller spicules and lack toxas, but there is probably just one species in the vicinity of Australia thus characterized (but having several names already attributed to it).

The species name selected refers to the fact that the specimen from Ponapé looked exceedingly like injected arteries.

The species first described as *Axociella calla* by de Laubenfels, 1934, page 16, is here transferred to the genus *Axocielita* because of its incrusting shape. The same action is also taken with that species first described as *Ophlitaspongia membranacea* by Thiele, 1905, page 450, and erroneously transferred to *Axociella* by de Laubenfels, 1936, page 113. The species *calla* is from the West Indies, and the species *membranacea* is from the west coast of South America.

GENUS *IOTROCHOSTYLA,* new

This genus is characterized by having a spiculation of smooth styles with birotulate microscleres. It obviously belongs close to such genera as *Iotrochota,* which is in the Desmacidonidae, and *Hiattrochota,* which is in the Myxillidae. Yet, it conforms nicely to the family diagnoses of Ophlitaspongiidae. If sponges were reclassified in such a way that those having similar microscleres were therefore in the same family, chaos would result, because as a rule it is discovered that exceedingly different species may have similar microscleres. Those having birotulate microscleres may constitute a special case, inasmuch as they do seem related in other respects—not true in

regard to species which have other microscleres. The type of this new genus is hereby designated as the species *Iotrochostyla iota.*

The generic name is based upon the resemblance to *Iotrochota,* and includes reference to the occurrence of styles.

Iotrochostyla iota, new

Text Figure No. 97

This species is here represented by the following:

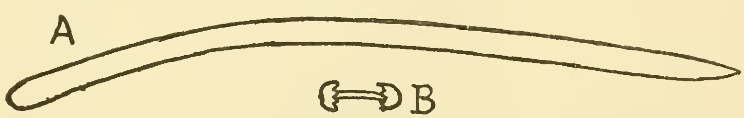
U.S.N.M. No. 22909, My No. M. 214, here designated as type, collected August 13, 1949, by diver from the west part of Truk lagoon, specifically at Lemotol Bay. The depth was 4 meters, and the substrate was dead coral. This species was common locally.

This species is a thin crust, measuring only 0.6 mm thick but spreading laterally for at least 20 cm.

The ectosome and endosome color in life was jet black, and the consistency was mediocre.

The surface is smooth and lipostomous.

The ectosome and endosome are not sharply separated from one another.



Text Figure No. 97. Spicules of *Iotrochostyla iota,* X 782. *A:* Style. *B:* Amphidisc.

The spiculation of this thin incrustation consists exclusively of smooth styles, 4 μ by 125 μ in dimensions, and amphidiscs or birotulate microscleres, 13 μ long. The latter do not have long, sharply separated clads, but the discs have many short teeth. The number could not be counted with accuracy.

One other species needs to be referred to this new genus. This was originally described as *Iotrochota magna* by Lambe, 1894, page 120, from the vicinity of Alaska. It was pale in color, and its spicules were very much larger than those of *iota.*

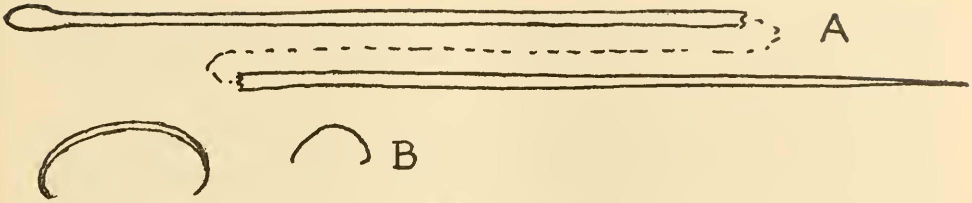
GENUS *DESMACELLA* Schmidt

Desmacella lampra, new

Text Figure No. 98

This species is here represented by the following:

U.S.N.M. No. 23088, My No. M. 470, here designated as type, collected August 13, 1949, by diver in the west part of the Truk lagoon, specifically at Lemotol Bay. The depth was 4 meters, and the substrate was dead



Text Figure No. 98. Spicules of *Desmacella lampra,* X 782. *A:* Tylostyle; the entire spicule shows, but in two parts. *B:* Two of the sigmas.

coral. This species was very common in the western portion of the Truk lagoon, perhaps in other portions also.

The shape is initially incrusting, but this species shows a tendency to continue vertical growth so that many massive specimens were found. The vertical measurement reached at least 10 cm. Horizontal measurements were at least 10 by 20 cm.

The ectosome and endosome color in life was fiery red-orange, and the consistency was soft, almost a colloidal sol.

The surface is very irregularly undulatory, but the pores and oscules both close so rapidly that the lipostomous condition is achieved.

The ectosome has only protoplasmic differentiation from the endosome, and in both the fleshy structures predominate without any conspicuous reticulate skeleton. There are, however, vague ascending tracts of spicules.

The skeleton consists of straight, smooth tylostyles, 2.5 μ by 250 μ. The heads are elongated in the same direction as the long axis of the spicule. The microscleres are sigmas, which may perhaps be regarded as of two size ranges. Many are as small as 13 μ; many others are between 30 μ and 33 μ in chord measurement.

No other species in *Desmacella* is extremely close to *lampra,* as most of them have very large, thick spicules or dull colors or both. Most of them also are persistently incrusting but show no tendency to rise up into massive shape.

The specific name is derived from the Greek word meaning "magnificent," especially "magnificent in color."

GENUS *MYCALE* Gray

Mycale armata Thiele

Text Figure No. 99

This species is here represented by the following:

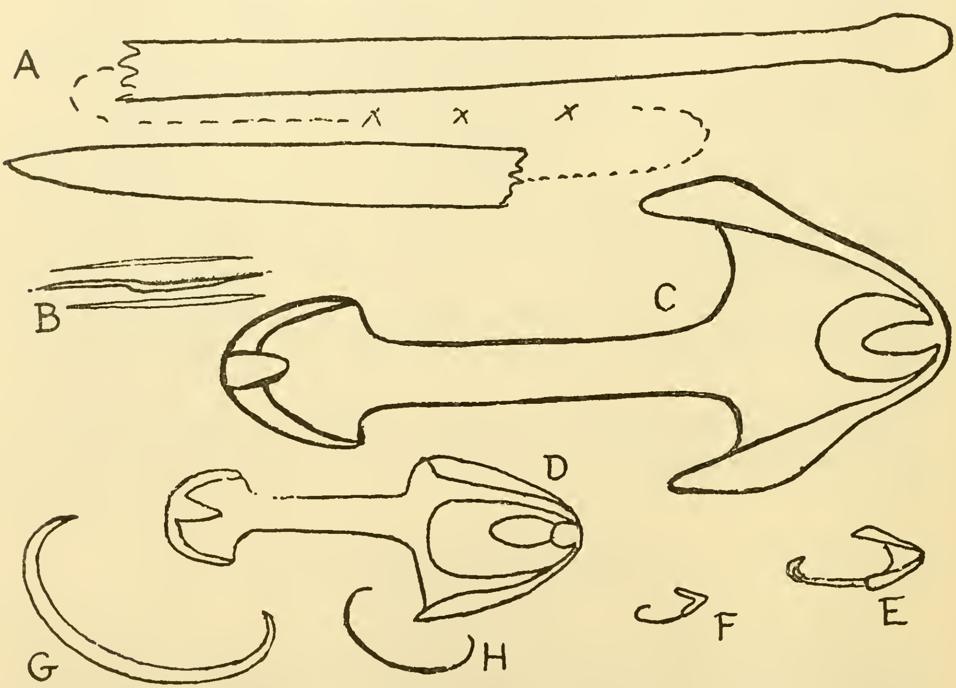
U.S.N.M. No. 22847, My No. M. 141, collected July 5, 1949, by diver at Ebon Atoll from the Pearl Pool which is in the west portion of the lagoon. The depth was 3 meters, and the substrate was dead coral. This species was very common in this vicinity.

U.S.N.M. No. 22987, My No. M. 365, collected July 5, 1949, by diver at Ebon Atoll in the south corner of the lagoon in the miniature lagoon which occurs there. The depth was 2 meters, and the substrate was dead coral. The species was also abundant in this locality.

U.S.N.M. No. 23050, My No. M. 429, collected August 1, 1949, by diver in the eastern portion of Ponapé (Matalanim) from a reef in the lagoon near an entrance to the lagoon. The depth was 5 meters, and the substrate was dead coral. The species was common here also.

U.S.N.M. No. 22928, My No. M. 234, collected September 2, 1949, by diver northwest of Koror near Ngarebagal Islet in the Palaus. The depth was 3 meters, and the substrate was peculiar. This sponge was upon another living sponge. It is possible that this species is abundant throughout the entire region studied and that many specimens, being small, are not collected by divers.

Most of the specimens are thin crusts, but this is not to be described as a typically incrusting species, because as growth continues it becomes thicker and thicker until some specimens are as much as 20 mm thick. Thicknesses



Text Figure No. 99. Spicules of *Mycale armata,* X 782. *A:* Tylostyle head and point; the mid portion is not shown, only the terminations. *B:* Raphides. *C:* Largest type of palmate anisochela. *D:* Second size of anisochela. *E:* Third size of anisochela. *F:* Smallest size of anisochela. *G:* Larger sigma. *H:* Smaller sigma.

between 3 and 13 mm are more common. Lateral growth occurs indefinitely. For example, specimen No. M. 141 completely covered a large, dead, ramose coral.

The exterior color in life was always a vivid red. This bright color extends to a depth of 1 to 3 mm in the sponge. Whenever specimens were more than 3 mm thick, the deeper portions were more orange than red. The consistency was primarily softly colloidal; but, inasmuch as the spicules could be felt by the fingertips, the adjective "gritty" was often applicable.

The surface is regularly smooth and usually lipostomous. Only under exceptional circumstances were specimens brought so quickly to the surface and into preservative that the pores were not first closed. Specimen No. M. 365 shows them to be 100 μ to 200 μ in diameter, about 5 per each square mm. Even in this specimen, the oscules cannot be distinguished from the inhalant openings.

The ectosome is characterized by a strong development of protoplasmic structures not sharply separated by extensive subdermal spaces from the underlying endosome. The latter is permeated by a fibro-reticulation, but this is very openwork with large areas of fleshy material in between the scattered tracts.

The skeleton consists, as noted above, of fibers which range from 90 μ to 150 μ in diameter and contain some spongin and many spicules. The megascleres, which are tylostyles, are astonishingly uniform in all the specimens from the many regions noted, ranging from 10 μ by 520 μ to 13 μ by 490 μ in size. There are typically seven microsclere sorts. First there are raphides, almost invariably about 40 μ long, although in Specimen No. M. 234 they were only 12 μ long. There are regularly two sizes of sigma, the larger 45 μ to 50 μ in chord length and smaller 15 μ to 22 μ in chord length. These are also very similar in all the specimens. There are four types of chela, always palmate anisochelas. The largest size is invariably present, and in no case were they found (in the summer of 1949) to be arranged in rosettes. Very often they were found in the echinating fibers, the small end embedded and the large end protruding from the fiber. This spicule category ranged from 122 μ to 140 μ in total length with very little variation between specimens. The next largest size was 70 μ in length; it was missing from about half the specimens studied. The third size was 25 μ in length. It was missing from about half the specimens, although not the same half in every case. The fourth and smallest size of chela varies from 12.5 μ to 16 μ in length and is almost always present. No specimens were found with less than two of these four kinds of chela. When so few occurred, one was always the largest size, but the second might be any of the other three kinds.

This species was first described as *Mycale armata* by Thiele 1903, page 950, from the East Indies. It is highly probable that several species since described should be reduced in synonymy to *armata,* but published descrip-

tions are not altogether satisfactory for bringing about this synonymy. It should be carried out after a study of type specimens. It is appropriate to predict that this species will be discovered abundantly throughout the western Pacific and East Indian as well as Australian regions.

GENUS *CARMIA* Gray

Carmia stegoderma, new

Text Figure No. 100

This species is here represented by the following:

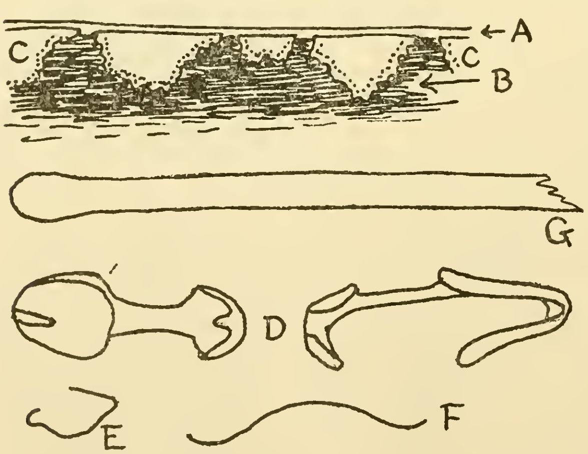
U.S.N.M. No. 22886, My No. M. 186, here designated as type, collected August 3, 1949, by divers in southwest Ponapé in the province of Kita near Toletik Islet. This was from a reef in the lagoon near shore. The depth was 4 meters, and the substrate was dead coral.

This species may be described as incrusting, but it has a very peculiar shape, to be discussed below. Its dimensions were about 7 cm laterally.

The ectosome color in life was gray-drab, and the endosome was yellowish-brown. The consistency was very fragile.

The surface is smooth and lipostomous.

The ectosome of this species is so far removed from the endosome that it seems questionable if there can be any connection. Yet, it is a typical sponge ectosome, and nothing but an ectosome. It is about 40 μ to 400 μ thick and fairly smooth and level, and it was very noticeable at the time of collection. It is stretched out over a large portion of the coral to which it makes contact only here and there at the apices of the highest elevations of the coral. Thus, there are large subdermal spaces beneath this ectosome,



Text Figure No. 100. *Carmia stegoderma.* The upper figure is a diagrammatic section of the sponge, perpendicular to the surface, NOT drawn with camera lucida. It is slightly enlarged. *A:* The ectosome. *B:* Jagged surface of coral, covered with a thin layer of *Carmia* endosome, which latter is here indicated by dots. *C:* The relatively enormous subdermal spaces. The spicules, illustrated in the lower portion of the figure, are all X 782. *D:* Two of the larger anisochelas, front and side views. *E:* Exceedingly thin, smaller anisochela. *F:* Toxa. *G:* Head end only, of one of the tylostyles.

spaces as great as 7 to 14 mm deep. The endosome forms an exceedingly thin incrustation attached intimately to the coral, following its irregularities. It is about 80 μ to 600 μ thick and contains here and there very feebly developed fibers which do not seem to make any reticulation at all.

The skeleton consists chiefly of smooth subtylostyles, about 6 μ by 500 μ. The heads are so very feebly developed that many of them might properly be called styles. In some cases, they are arranged in tracts with little or no spongin. The tracts or fibers are about 130 μ in diameter. Most of these spicules are in the endosome; very few, if any, in the conspicuous but widely separated dermis. The microscleres consist of sigmas only slightly curved, 33 μ in chord length; toxas 40 μ in length; abundant palmate anisochelas, 40 μ long; and exceedingly rare palmate anisochelas, 15 μ long. The microscleres are equally abundant in the dermis and the endosome.

This species has a unique manner of growth.

The name is derived from the Greek words for "roof" and "skin," because the dermal structures make such a striking ceiling or roof over the interior.

GENUS *OXYCARMIA*, new

This genus is established in the family Ophlitaspongiidae, to have as genotype the species *Oxycarmia confundata.* It is characterized by megascleres which include tylostyles, as typical of *Carmia,* and very numerous oxeas, which is astonishing and probably shows relationship to the genus *Oxymycale,* which is in the family Desmacidonidae. Microscleres, as in *Carmia,* include anisochelas, toxas, and sigmas. The generic name is based upon the resemblance to *Carmia* and includes reference to the occurrence of oxeas.

Oxycarmia confundata, new

Text Figure No. 101

This species is here represented by the following:

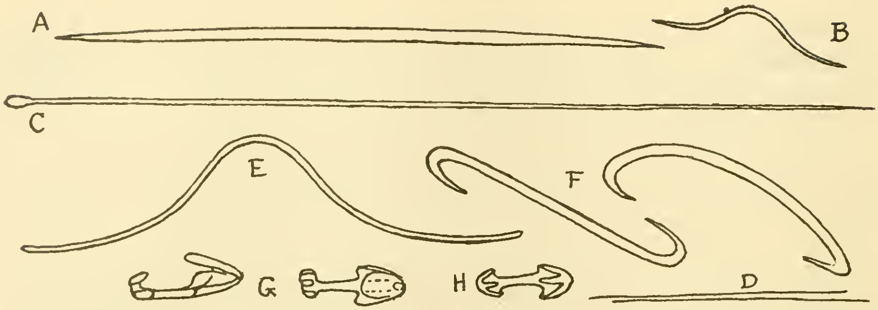
U.S.N.M. No. 22874, My No. M. 170, here designated as type, collected July 30, 1949, by diver in northwest Ponapé between the reef and the shore. The depth was 5 meters, and as substrate was growing upon a live sponge, My No. M. 403, *Neopetrosia pandora.*

The sponge is a thin crust, 1 mm thick, and covers about 10 square cm.

The ectosome and endosome color in life was red, and the consistency was mediocre.

The surface is smooth and lipostomous.

The ectosome is separated from the endosome, not only by being more densely protoplasmic but by having many of the oxeas arranged perpendicular to its layer. The protoplasmic dermis is only about 15 μ thick. In the endo-



Text Figure No. 101. Spicules of *Oxycarmia confundata*. *A:* Oxea, X 182. *B:* Larger toxa, X 182. *C:* Tylostyle, X 782. *D:* Raphides, X 782. *E:* Smaller type of toxa, X 782. *F:* Two of the sigmas, seen from different angles, X 782. *G:* Palmate anisochelas, side and front view, X 782. *H:* Abnormal, perhaps arcuate anisochela, X 782.

some the oxeas are common, being arranged in a sort of criss-cross pattern with the tylostyles in bundles in among the oxeas.

The skeleton consists first of tylostyles, straight, smooth, and thin, 1 μ by 225 μ, and of very abundant oxeas, smooth and sharp-pointed, 15 μ by 685 μ in dimensions. A few of these have rounded ends, so that they become styles and in some cases strongyles; but the oxeote forms are very much the commonest. The microscleres include very thin raphides about 0.3 μ by 60 μ to 120 μ. There are large toxas of typical shape, 130 μ to 235 μ in length. There are also a few smaller ones only 60 μ long. The sigmas also occur in two sizes; the larger ones 70 μ long and the smaller 20 μ in chord length. Only one size of chelas are found, and these are usually rather typically shaped palmate anisochelas, although a very few have the central projection so narrow that they might be termed arcuate anisochelas. Their length is about 20 μ. This type of spicule is exceedingly uncommon in the phylum Porifera. Arcuate spicules are usually isochelas rather than anisochelas.

This species, as well as the genus, is set off from other sponges by the occurrence of both oxeas and tylostyles, with the peculiar microscleres as in the genera *Mycale* and *Carmia*. Attention may be called to the occurrence of some arcuate anisochelas.

The specific name is derived from the Latin and refers to the curious conglomeration of spicules found in this sponge.

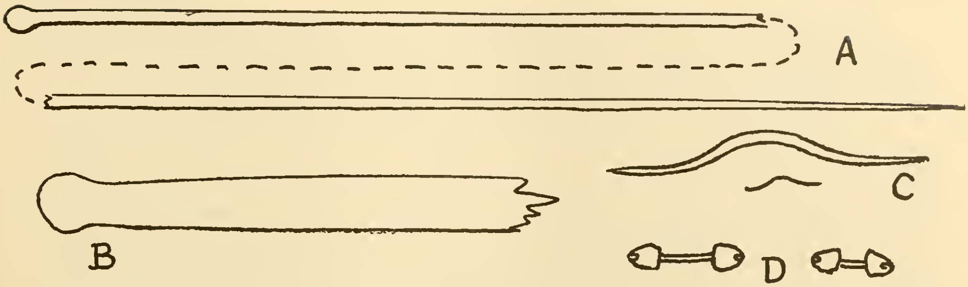
GENUS *AXOCIELITA* de Laubenfels

Axocielita linda, new

Text Figure No. 102

This species is here represented by the following:

U.S.N.M. No. 22860, My No. M. 154, here designated as type, collected on July 11, 1949, by diver at Likiep Atoll in the southeast corner of the



Text Figure No. 102. Spicules of *Axocielita linda,* X 782. *A:* Smaller tylostyle; the entire spicule is shown, but in two parts. *B:* Only the head of one of the larger tylostyles. *C:* Toxas of larger and smaller size. *D:* Palmate isochelas.

lagoon near the church. The depth was 3 meters, and the substrate was dead coral.

U.S.N.M. No. 22830, My No. M. 106, collected June 11 by hand while wading at Ailing-lap-lap Atoll near the south portion of the lagoon. The depth was near low tide mark, and the substrate was dead coral.

U.S.N.M. No. 22898, My No. M. 200, collected August 10, 1949, by diver at Moen Islet in Truk lagoon. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 22901, My No. M. 205, collected August 13, 1949, by diver from the west portion of Truk lagoon south of Pollé Islet near mangroves. The water was colored brown with organic material. The depth was 1 meter, and the substrate was fragments of dead coral.

This species was common in the lagoons of Ailing-lap-lap and Likiep Atoll and in the vicinity of Truk. It quite likely occurs in many other portions of the western Pacific. Thin red crusts, too minute to be detached, are extremely widespread. Many of these, not successfully collected, may have been of the present species.

As noted above, this is regularly a very thin crust, about 300 μ to about 1 mm in thickness. The exception was Specimen No. M. 205, collected near mangroves from water full of plant coloring material. This specimen in places reached a thickness of 10 mm but remained incrusting without any tendency to proliferate. Lateral growth was indefinite, often as much as 14 cm.

The color in life was bright spectral red, and the consistency mediocre, often somewhat slimy.

The surface is smooth and regularly lipostomous, although in some cases subdermal canals show like miniature river systems. It is probable that these terminate at oscules, which are quickly closed.

No sharp distinction can be made between ectosome and endosome in exceedingly thin sponges. The spicules are arranged partly in confusion, and in other cases with the points upward perpendicular to the surface.

The skeleton consists of both megascleres and microscleres. The former are all tylostyles, but of two size ranges. The larger, which is usually somewhat less common than the smaller, may reach a dimension of 9 μ by 435 μ. Spicules of the smaller, more abundant category range from 2 μ to 3 μ in thickness and 200 μ to 400 μ in length. In the abnormally thick specimen mentioned above (M. 205), the spicules were extra small, only 1.5 μ by 180 μ. The microscleres and other aspects of this specimen were quite typical. The microscleres include toxas of two size ranges. The larger size are from 55 μ to 80 μ long, and the smaller from 15 μ to 33 μ long. In those specimens in which one category is a little larger than average, the other category is also a little larger than average, and vice versa. Among the microscleres there are also palmate isochelas ranging from 12 μ to 20 μ in length but usually between 15 μ and 17 μ. Those of this type, from the Ailing-lap-lap specimen (M. 106) were strongly contort, so twisted in fact that if one of the shovels was in face view, the other could be seen only in profile. This might be considered so distinctive that a separate species should be erected for the Ailing-lap-lap sponge, but de Laubenfels (1947, page 35), in making an ecological study of sponges in the vicinity of Beaufort, North Carolina, reports extensively on *Microciona prolifera,* which exists there in abundance. Careful study showed that specimens undoubtedly of the same species (in among others that were typical) had this palmate isochela with the contort structure. In fact, in one portion of the same sponge chelas might be normal, while in another portion they were twisted.

This new species is distinctive for its lack of plain styles, having only tylostyles, and for the two categories of toxas which are also worthy of comment.

The specific name alludes to the beauty of this species.

GENUS *FASUBERA* de Laubenfels

Fasubera debrumi, new

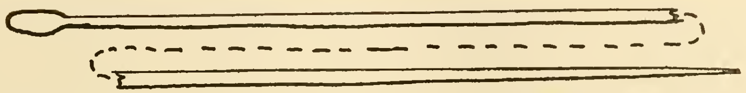
Text Figure No. 103

This species is here represented by the following:

U.S.N.M. No. 22869, My No. M. 164, here designated as type, collected July 11, 1949, by diver at Likiep Atoll from the east end of the lagoon near Lado Isle. The depth was 5 meters, and the substrate was dead coral.

This species is a thin incrustation less than 1 mm thick, and the lateral dimensions are at least 15 cm.

The color in life was blood red, and the consistency was fleshy.



Text Figure No. 103. Spicule (tylostyle) of *Fasubera debrumi,* X 782.

The surface is fundamentally smooth, but inasmuch as the incrustation covered very lumpy coral, the optical illusion of a conulose surface is given. As might be expected, this very thin sponge is lipostomous.

Ectosome and endosome cannot be satisfactorily differentiated.

The skeleton consists of spicules of one type only, chiefly erect, with their heads at the substratum and their points perpendicular to the surface. These are tylostyles, with heads which are long in the direction of the long axis of the spicule. The total dimensions of this megasclere commonly are 2.5 μ by 225 μ.

The other species of *Fasubera,* described first as *Hymedesmia lipochela* by Dendy 1921, page 82, from the Indian Ocean, had spicules with rather typical heads and much larger size.

The species name selected here is given in recognition of a family which is resident in Likiep Atoll named de Brum. Members of this family were very helpful in promoting scientific study in this part of the world. In this regard, special mention may be made of Raymond de Brum.

GENUS *FOLITISPA* de Laubenfels

Folitispa pingens, new

Text Figure No. 104

This species is here represented by the following:

U.S.N.M. No. 22924, My No. M. 230, here designated as type, collected September 1, 1949, by divers at Iwayama Bay near Koror in the Palaus. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 22918, My No. M. 224, collected September 1, 1949, and

U.S.N.M. No. 22930, My No. M. 236, collected September 6, 1949, both from the same general areas as No. M. 230. This species is very abundant in all the water around the Palau Archipelago.

U.S.N.M. No. 22885, My No. M. 185, and

U.S.N.M. No. 22889, My No. M. 189, both collected August 3, 1949, by diver from the southwest portion of Ponapé near Toletik Isle in the province of Kiti from a reef in the lagoon near the shore. The depth was 4 meters, and the substrate was dead coral.

This species is incrusting and most specimens are under 1 mm in thickness, but older specimens (such as particularly No. M. 224) reach a thickness of 10 mm in places. There is no indication of even a beginning of proliferation. Lateral dimensions are often as much as 10 or 20 cm.

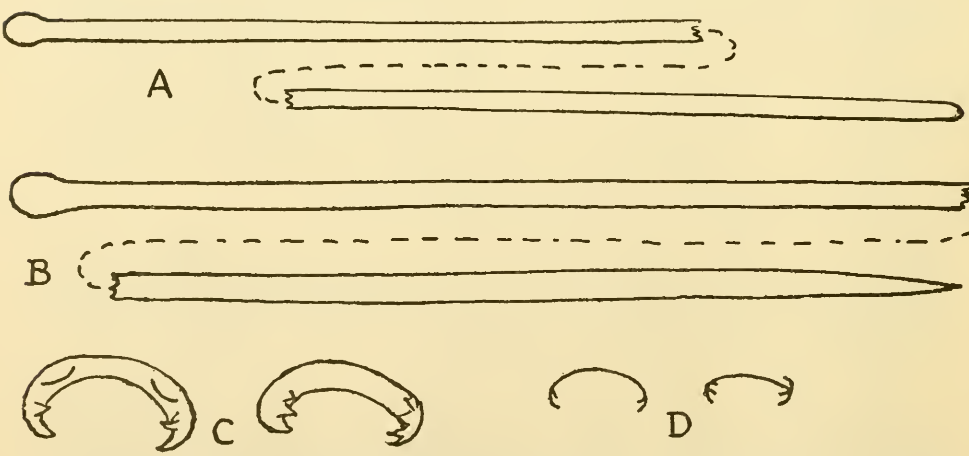
The color in life was vivid red, a tint often called carmine. The interior was darker than the exterior in the thicker specimens. The consistency was soft and could be compared to wet paper.

The surface is fundamentally smooth but is microscopically velvet-like or hispid. It is lipostomous, but the occurrence in places of obvious subdermal spaces making patterns somewhat like miniature river systems indicates the probable existence of oscules at the terminations of these rivers. These oscules were already closed upon collection.

The ectosome consists of a very definite dermis, rather easily detached from the underlying tissue. The thickness of its flesh is only about 10 μ or 20 μ. In this ectosome, many of the spicules are erect with points out; others are in confusion. The spicules in the endosome are also chiefly in confusion, but it is probable that the faint pattern which occurs appropriately may be described as slightly plumose.

The skeleton consists of megascleres and microscleres. The former are smooth straight tylostyles with such blunt points that all of them approach, and some of them actually reach, the shape which may be termed tylostrongyle. The dimensions range from 3 μ by 233 μ to 5 μ by 310 μ. The microscleres are strongly curved anchorate isochelas of two size ranges. The largest size is about 30 μ in chord length and is very thick, up to at least 5 μ. The isochelas in the smaller size range are about 15 μ in chord length and are exceedingly thin, in many cases less than 1 μ thick.

The only other species hitherto described in the genus *Folitispa* is that which was first described as *Hymedesmia laevissima* by Dendy, 1921, page 81, from the Indian Ocean region. It had spicules far larger than those of *pingens*. They were up to 20 μ by 660 μ in dimensions.



Text Figure No. 104. Spicules of *Folitispa pingens,* X 782. *A:* Tylostrongyle. *B:* Tylostyle. *C:* Arcuate isochelas of larger size. *D:* Smaller isochelas.

The specimens of *pingens* from Ponapé consistently have very sharp-pointed megascleres instead of dull-pointed ones (as in the above description of the type), and the isochelas are of only one size range (the larger size) and sometimes have more than 4 teeth. It is possible that this merely indicates a range of variation within a single species. However, at some future time it may seem advisable to erect either a new species or subspecies for the Ponapé specimens.

The specific name *pingens* may be translated "painting," being derived from the present participle of the Latin word "to paint."

GENUS *OPHLITASPONGIA* Bowerbank

Ophlitaspongia mima, new

Text Figure No. 105

This species is here represented by the following:

U.S.N.M. No. 22839, My No. M. 125, here designated as type, collected June 29, 1949, by diver at Majuro Atoll near the west end of the lagoon near Laura Islet. The depth was 2 meters, and the substrate was dead coral. This species is quite common in Majuro Atoll.

U.S.N.M. No. 22842, My No. M. 131, collected July 2, 1949, by diver at Majuro Atoll in the southeast corner of the lagoon near Te-elop Islet. The depth was 2 meters, and the substrate was dead coral.

This is an incrusting species less than 1 mm thick, but spreading indefinitely over dead coral.

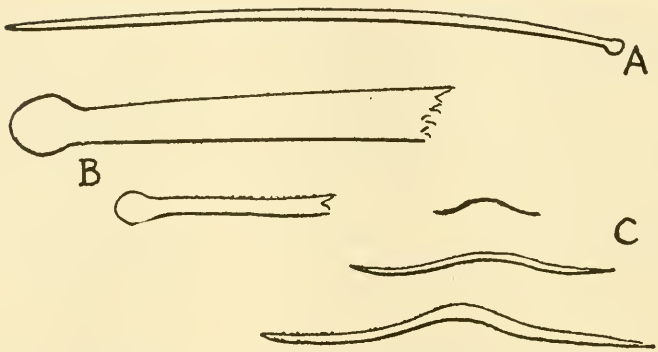
The color in life was a bright red, verging towards vermillion. The consistency was soft colloidal sol.

The surface is smooth and lipostomous.

The ectosome cannot be sharply differentiated in a species such as this one, which is often only 300 μ thick. Many of the spicules are longer than the total thickness of the sponge.

The skeleton consists of smooth tylostyles with rather large round heads. They vary in size from about 4 μ by 360 μ to 9 μ by 450 μ. The microscleres consist of toxas which vary from 20 μ to 70 μ in length. The larger ones may be as much as 3 μ or 4 μ thick.

Very numerous species have been described in the genus *Ophlitaspongia,* but most of them have already been transferred, quite properly, to other genera. Another that needs such transfer is *Ophlitaspongia inornata,* Hallmann, 1912, page 265, which should be placed in *Echinoclathria.* Others should be removed, as noted below, to a new genus. The opinion is expressed here that other than this new species from the western Pacific, there are described in the world only three or four additional species of *Ophlitaspongia.* The type species, which was first described as *Spongia seriata* by Grant,



Text Figure No. 105. Spicules of *Ophlitaspongia mima. A:* Tylostyle, X 182. *B:* Heads of two of the tylostyles, X 782. *C:* Three of the toxas, X 782.

1826, page 116, is European, and has spicules much smaller than those of *mima. Nidificata,* which was first described by Kirkpatrick, 1907, page 274, from the Antarctic, and also has been reported from South America, has spicules much larger than those of *mima.* The third species was first described as *Desmacella pennata* by Lambe, 1894, page 129 from the west coast of North America. It also has been reported from the same coast by de Laubenfels, 1927, page 265, and 1932, page 103. This has megascleres much thicker than those of *mima,* and some of them have heads incipiently spined.

The species *basifixa,* described from the north Atlantic by Topsent, 1913, page 39, and recorded from Japan by Burton, 1935, page 74, is a black crust with two size-ranges of monactinal megascleres. It is here left in *Ophlitaspongia* with doubt.

The name *mima* is selected because this species tends to mimic the others of its genus.

GENUS *LITASPONGIA,* new

This genus is here established in the family Ophlitaspongiidae for sponges which, like *Ophlitaspongia,* have monactinal megascleres and only toxas as microscleres, but unlike the incrusting *Ophlitaspongia,* they are ramose or arborescent in growth. The type is here designated as the species described as *Ophlitaspongia arbuscula* by Row, 1911, page 347, from the Red Sea. His *O. horrida* from the same locality (page 349) is here dropped in synonymy to *arbuscula.* A second species for this genus is that described as *Echinoclathria nodosa* by Carter, 1885, page 356, from southeastern Australia. His *E. subhispida* from the same locality (page 356) is here dropped in synonymy to *nodosa.*

GENUS *ECHINOCLATHRIA* Carter

Echinoclathria waldoschmitti, new

Text Figure No. 106

This species is here represented by the following:

U.S.N.M. No. 23092, My No. M. 474, here designated as type, collected August 17, 1949, by diver at Kuop Atoll near Givry Islet in the northeastern corner of the lagoon. The depth was 2 meters, and the substrate was dead coral.

The specimen is cylindrical, 2 cm in diameter and 18 cm high.

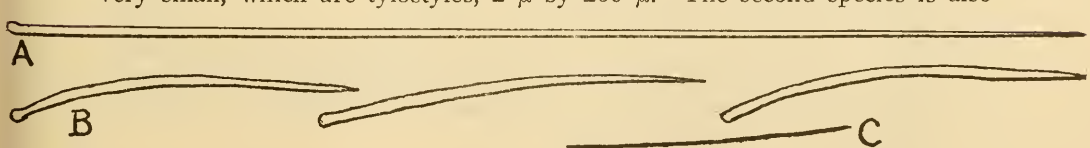
The ectosome and endosome color in life was bright orange, and the consistency was spongy.

The surface is conulose, due to projecting fibers, 3 mm high and 3 mm apart. There are numerous apertures in the surface, many of them as much as 1 mm in diameter but some of various smaller sizes. It is not feasible to discriminate between the exhalant and inhalant openings, because there is no sharp differentiation in the size of these apertures.

The ectosome is a fleshy dermis, but is closely attached to the underlying tissues into which it more or less blends. The interior is a fibro-reticulate structure with considerable protoplasmic material present.

The skeleton consists of fibers about 200 μ in diameter, containing spongin and spicules. As in all typical members of the family Ophlitaspongiidae, the same type of spicules both core and echinate the fibers. These spicules are styles or subtylostyles, 9 μ by 280 μ, to 13 μ by 255 μ in dimensions. The interstitial spicules are very straight smooth styles, or subtylostyles, 7 μ by 785 μ.

It is here considered that this is the fourth species for the genus *Echinoclathria*. The first, or type, was first described as *Spongia leporina* by Lamarck, 1814, page 444, and referred to this genus by Topsent, 1932, page 101. Topsent properly dropped in synonymy to this the species described as *Echinoclathria tenuis* by Carter, 1885, page 335, which had previously been the type. *Ophlitaspongia inornata*, Hallman, 1912, page 265, also is transferred here into synonymy to *leporina*. This species is Australian and is characterized by coring spicules which are styles, 9 μ by 120 μ, and interstitial spicules, very small, which are tylostyles, 2 μ by 200 μ. The second species is also



Text Figure No. 106. Spicules of *Echinoclathria waldoschmitti*, X 182. *A:* Tylostyle of the type which may be regarded as coring the fibers, or even as replacing the fibers. *B:* Tylostyles of the sort which echinate the fibers, or echinate the longer spicules. *C:* Slender spicules, perhaps to be called raphide; probably they are juvenile megascleres.

Australian and has smaller coring spicules, and the interstitial spicules are peculiar strongyles, often as small as only 1 μ by 100 μ. It is typically also a very honeycombed structure. It was first described as *Halme laxa* by Lendenfeld, 1886, page 847, and referred to *Echinoclathria* by Hallman, 1914, page 287. Hallmann correctly points out that *Halme gigantea* Lendenfeld, same page and same location, should probably fall in synonymy, and this is confirmed here. Lendenfeld, 1888, page 226, described a sponge as *Plectispa arborea.* Although it is not particularly honeycombed, it agrees in other ways and here is also dropped in synonymy to *laxa.* The third species was first described by Lambe 1893, page 76, from Alaska and was misidentified as being *Phakellia papyracea* Ridley and Dendy. Hentschel 1929, page 975, recognized it as new, naming it *beringensis,* but left it in *Phakellia.* De Laubenfels 1942, page 264, redescribed it from Baffin Bay as *Echinoclathria schmitti. Echinoclathria beringensis* is abundant in the Arctic, and sharply characterized by vase-shape; its spicules are practically identical with those of *waldoschmitti.*

The name is given in respect to the eminent zoologist, Waldo L. Schmitt.

The sponge first described as *Echinoclathria favus* by Carter, 1885, page 292, here is transferred to *Axociella,* because of its possession of palmate isochelas. The genus *Plectispa* Lendenfeld, 1885, page 225, needs to have its genotype designated. Therefore, this is selected here as *Plectispa arborea* Lendenfeld, 1885, page 226. But, as noted above, this is transferred to *Echinoclathria,* and therefore the genus *Plectispa* falls in synonymy to *Echinoclathria.* The other two species put into *Plectispa* were placed there by Lendenfeld, 1885, page 226. They were named *elegans* and *macropora.* Hallman, 1914, page 300, by his use of asterisks, indicates that he found no such specimen in the Australian Museum, and they were originally described by Lendenfeld in his account of sponges of the Australian Museum. They must be regarded as ill-known and perhaps nonexistent species.

FAMILY AMPHILECTIDAE de Laubenfels

GENUS *ULOSA* de Laubenfels

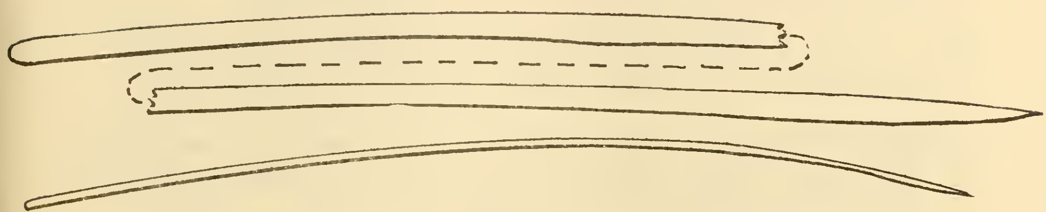
Ulosa spongia, new

Text Figure No. 107

This species here is represented by the following:

U.S.N.M. No. 22851, My No. M. 145, here designated as type, collected July 5, 1949, by diver at Ebon Atoll at the south corner of the lagoon in the miniature lagoon which is there located. The depth was 2 meters, and the substrate was dead coral.

This is an incrusting sponge but is very uneven in thickness, some portions being as much as 10 mm thick while others are only 1 mm thick. It spreads laterally at least 10 cm.



Text Figure No. 107. Spicules (styles) of *Ulosa spongia,* X 782.

The exterior color in life was yellow, but the interior was pale and dull. The consistency was very spongy.

The surface, as noted above, is very uneven and rough. The pores and oscules were impossible to discriminate from the cracks and rugosities in the surface.

The ectosome is quite definite, but only 10 μ thick. It is a dermis very full of spicules in confusion. The endosome was remarkably like that of the genus *Spongia,* with a fibro-reticulation.

The skeleton consists primarily of fibers of spongin, but these fibers are packed with spicules, the diameter of the whole being about 50 μ. The spicules consist of smooth styles, about 5 μ by 500 μ in dimensions. Quite a number are smaller, about 2 μ by 165 μ; this may possibly constitute a second category, but the opinion here is expressed that the smaller ones are merely immature forms of the other spicules.

The type of *Ulosa* is a sponge first described as *Spongia angulosa* by Lamarck, 1814, page 376, from the Australian region. Its spicules are very much smaller than those of the present species. The same is true of that *Ulosa* which was first described as *Strongylacidon intermedia* by Burton, 1934, page 550, from the same region. The next species which was referred to *Ulosa* is that first described as *Stylotella topsenti* by Arnesen, 1920, page 18, from the region of western Africa. Its spicules are half as long, but four times as thick as those of *Ulosa spongia.* This species was incorrectly referred to *Hymeniacidon* by de Laubenfels, 1936, page 137, but correctly referred to *Ulosa* by the same author in the same reference on page 126.

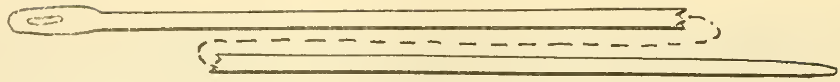
The species name refers to the resemblance of the fibers to those of *Spongia.*

GENUS *STYLOTRICHOPHORA* Dendy
Stylotrichophora rubra Dendy

Text Figure No. 108

This species is here represented by the following:

U.S.N.M. No. 22845, My No. M. 136, collected July 5, 1949, by diver at Ebon Atoll from the Pearl Pool which is in the western portion of the



Text Figure No. 108. Spicule (tylostyle) of *Stylotrichophora rubra,* X 782.

lagoon. The depth was 5 meters, and the substrate was dead coral. This is one of the species which occur usually on the underside of the coral. It was abundant in Ebon Atoll.

This is an incrusting sponge, usually only about 300 μ thick, spreading laterally indefinitely, though most of its incrustations were less than 3 cm across.

The color in life was brilliant red, and the consistency a colloidal sol. It is remarkable to note, however, that upon placing the specimen in alcohol, this consistency changed to become quite tough—an alteration which is not to be expected.

The surface is shiny smooth and lipostomous.

The ectosome comprises a very definite dermis, 10 μ to 40 μ thick, containing foreign material, particularly bits of dead Bryozoa. The endosome is well provided with flagellate chambers, 50 μ to 60 μ in diameter, and also contains spicular tracts.

The skeleton includes spongin uniting spicules into tracts which are not at all echinated but which contain some spicules and even more foreign material, such as small bits of sand. These fibers or tracts are about 25 μ in diameter. The spicules consist of smooth straight tylostyles with heads only slightly greater in diameter than the shaft but quite long in the direction of the long axis of the shaft. It appears as though this enlargement was brought about almost entirely by an enlargement of the axial canal of the spicule, as a result of which, from whatever angle the spicule is viewed, there is a strong resemblance to a needle with an eye in the regular place. These spicules vary from 3 μ by 220 μ to 4 μ by 230 μ in dimensions. Numerous raphides, 0.2 μ by 40 μ, also are present.

This species was first described as *Stylotrichophora rubra* by Dendy, 1895, page 259, from Australia. Dendy did not comment on any resemblance of the spicules to needles, but his description in every other respect agrees remarkably closely.

GENUS *BIEMNA* Gray

Biemna fortis (Topsent) Burton

Text Figure No. 109
Plate VI, Figure b

This species is here represented by the following:

U.S.N.M. No. 23034, My No. M. 413, collected July 30, 1949, by diver in northwest Ponapé from the lagoon near the shore. The depth was 3 meters, and the substrate was dead coral.

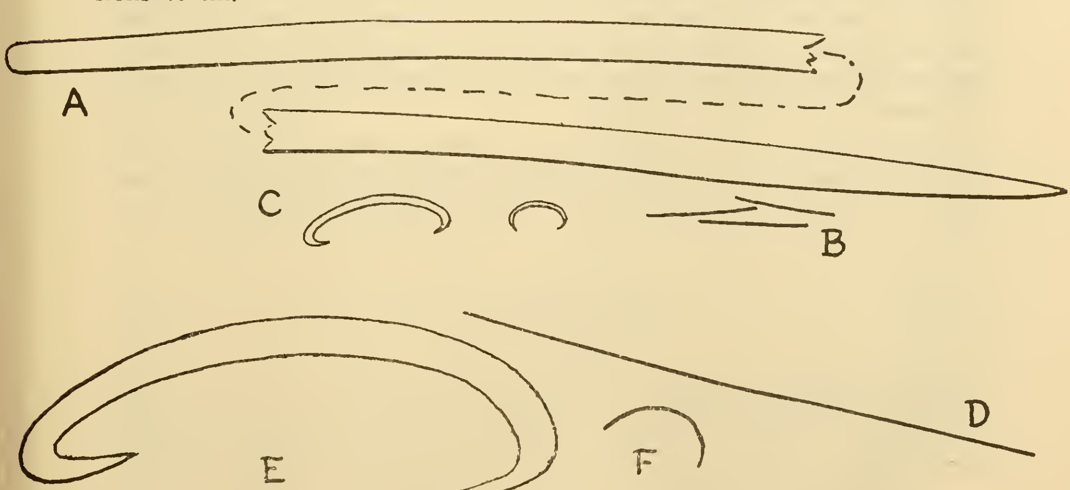
U.S.N.M. No. 23081, My No. M. 463, collected August 13, 1949, by hand while wading in the west part of Truk lagoon south of Pollé Islet. The depth was about 50 cm, and the substrate presumably was from coral sand but apparently was out of mud.

U.S.N.M. No. 23084, My No. M. 466, collected August 13, 1949, by hand while wading in the west part of Truk lagoon near Pollé Islet in the vicinity of mangroves. The water was very shallow and much discolored with vegetable material in solution or suspension. The depth was only 30 cm, and the substrate was muddy sand.

U.S.N.M. No. 23101, My No. M. 483, collected September 1, 1949, by diver in Iwayama Bay near Koror in the Palaus. This was also from muddy water near mangroves; but the depth was 2 meters, and the substrate was dead coral.

This species is very abundant throughout the vicinity of the Palau Archipelago and in the vicinity of Truk. It is present, but somewhat less abundant, in Ponapé. It is noteworthy that in the latter location one specimen was found in clean water. All the others were found in the vicinity of vegetation, in shallow, dirty, discolored water. Most of the specimens are partially buried while still living.

This sponge appears as a mass or cake from which numerous chimneys arise. No. M. 466 was an exception in this regard in that the whole top of the sponge protruded above the dirty sand, but all the other specimens noted had the basic mass completely under the mud, and only the chimneys protruding. The vertical measurements reached 30 cm, and the lateral dimensions 40 cm.



Text Figure No. 109. Spicules of *Biemna fortis*. *A:* Style, X 182. The entire spicule is shown, but in two parts. *B:* Raphides, X 182. *C:* Sigmas, X 182. *D:* Raphides, X 782. *E:* Larger sigma, X 782. *F:* Smaller sigma, X 782.

The color in life was obscured by the foreign material so that the field notes regularly say "dirty," "dirty-drab," or "dirty-white." One may speculate that the sponge if really clean would be pale gray or nearly white. The interior is about the same as the exterior, except that some specimens show a slightly ochre or yellowish tint to the interior whereas other specimens do not. The consistency in life was woody, cork-like, or like wet cardboard. The latter is perhaps the most graphic description.

The surface is uneven and almost always obscured by mud. In a few places where such was not the case, it would seem to be sparsely hispid. Diligent search disclosed no pores. With the mass of the sponge so deeply buried, it seems problematical that pores would be effective in the usual location. Can it be that some of the large openings, ostensibly oscules, may have been really inhalant, as others were exhalant? The oscules are from 5 to 8 mm in diameter, by the inside measurement of the tubes or chimneys. The latter may rise as much as 5 to 10 cm above the main mass of the sponge (well above the sand or mud) and are quite common, often only 2 cm apart.

The ectosome is characterized by a mass of tangent dermal spicules and in some cases also by erect additional spicules. The interior, in a few cases, shows arrangement into tracts, but often is a mass of spicules and flesh permeated by ramifying canals.

The skeleton does contain occasional tracts as much as 360 μ in diameter but is mostly a profuse abundance of felted spicules. The megascleres are smooth styles, often somewhat curved, and upwards of 30 μ by 120 μ. Smaller forms, probably developmental, do occur. The microscleres include sigmas of two sizes. The larger may be as much as 92 μ in chord length and 6 μ in diameter. The smaller category range from 17 μ to 21 μ in length and are very thin, about 0.5 μ in diameter. There also are present exceedingly abundant trichodragmas and masses of wisp-like raphides, about 0.3 μ in diameter and 70 μ to 100 μ long.

This species was first described as *Desmacella fortis* by Topsent 1897, page 463, from the East Indies. Burton in 1930, page 521, correctly transferred it to the genus *Biemna* and extended its range to the Red Sea.

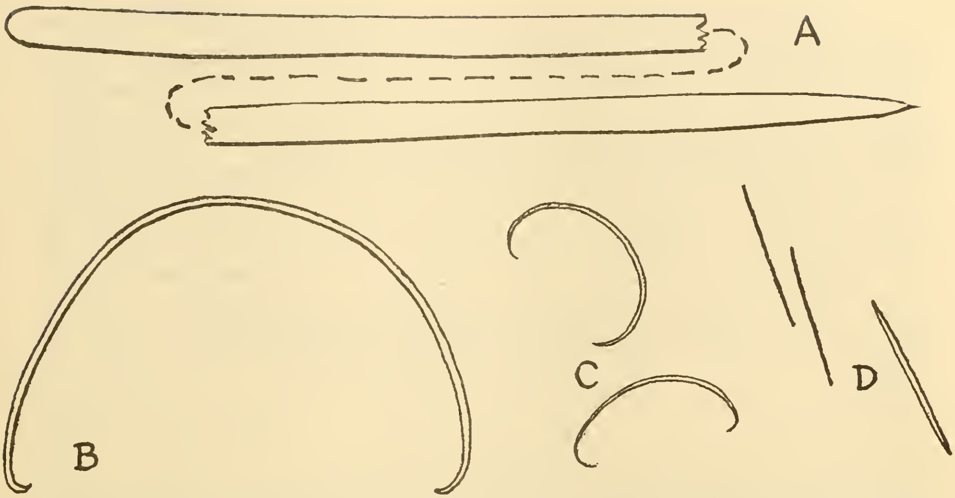
Biemna mnioeis, new

Text Figure No. 110

This species is here represented by the following:

U.S.N.M. No. 23065, My No. M. 445, here designated as type, collected August 3, 1949, by diver in the southwest portion of Ponapé, province of Kiti, from a reef in the lagoon. The depth was 3 meters, and the substrate was dead coral.

This is an irregular mass 3 by 3 by 6 cm in outside dimensions.



Text Figure No. 110. Spicules of *Biemna mnioeis,* X 782. *A:* Style; the entire spicule is shown, but in two parts. *B:* Peculiar large sigmoid spicule. *C:* Commonplace sigmas. *D:* Raphides.

The exterior color in life was a dark dull green. This did not stop sharply but penetrated to a depth of 3 or 4 mm, gradually shading or blending into the yellow endosome. The consistency was slimy, somewhat like wet bread, and it was very easily torn.

The surface is exceedingly irregular and rugged. There are primary rugosities about 2 or 3 mm in diameter and 2 or 3 mm high, so crowded that the spaces between them are only 1 to 2 mm wide. Yet these protrusions are in turn lumpy, with tubercles nearly 1 mm high and nearly 1 mm in diameter all over the surface. The pores and oscules cannot be located in this confused situation.

The ectosome is characterized principally by the color and does not differ sharply from the endosome, but there are more dense protoplasmic structures right at the surface. The endosome is micro-cavernous.

The skeleton consists chiefly of spicules in confusion. There are megascleres which are smooth styles, 7 μ by 240 μ in dimensions, and there are sigmas of two sizes and types. The larger ones are 1 μ to 2 μ in diameter and 80 μ in chord length. There is a single semicircular curve, and at each end of it a small recurved portion, so that the whole resembles the removable handle of a bucket. Perhaps these should be regarded as toxas, rather than as sigmas. The smaller sigmas are 28 μ in chord length and are rather typical in shape. Raphides, about 28 μ long, sometimes aggregated into bundles, also are present and therefore they might be called trichodragmas.

Apparently there are two species of the genus *Biemna* in Ponapé, but this is subject to question, because it here is suggested that the species *mnioeis*

may eventually be placed in another genus. The spiculation is exactly that of *Biemna,* but the peculiar surface structure and slimy consistency are utterly unlike specimens undoubtedly of the genus *Biemna.* The shape of the larger sigmas is striking and more like that found in some sigma-containing species of the Desmacidonidae than like anything else in *Biemna.*

The species name is *mnioeis,* derived from a Greek word for moss, and refers to the unusual surface of this species.

ORDER HALICONDRINA Vosmaer (or Halichondrida*)

FAMILY AXINELLIDAE Ridley and Dendy

GENUS *AULETTA* Schmidt

Auletta bia, new

Text Figure No. 111
Plate VIII, Figure a

This species is here represented by the following:

U.S.N.M. No. 23023, My No. M. 402, here designated as type, collected July 30, 1949, by diver in northwest Ponapé between the reef and the shore. The depth was 5 meters, and the substrate was dead coral. This species also was found in southwest Ponapé near Kiti and may be regarded as moderately common throughout the vicinity of Ponapé.

The shape is amorphous, but it has large conspicuous processes rising from a basal mass. Sometimes the total height reaches 25 cm, and the diameter as much as 40 cm. The processes are often 3 or 4 cm in diameter and rise 6 or 8 cm above the main surface of the sponge.

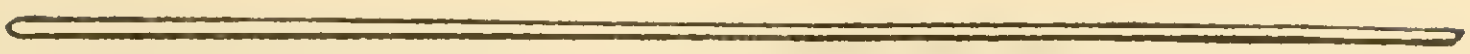
The color in life was whitish drab. That of the endosome is slightly darker than that of the ectosome. The consistency was mediocre.

The surface is complex tuberculate. There are many tubercles about 3 mm in diameter and 3 mm high. They are widely separated, and the spaces between them often are greater than the diameter of the sharply marked tubercles. The surfaces of these primary tubercles are in turn at least granular, certainly not smooth. The pores could not be seen, but the oscules were very conspicuous, 2 cm or slightly more than 2 cm in diameter. These are the openings at the summits or apices of the conspicuous processes.

The ectosome is a complex reticulation with meshes of very great diversity of size and shape. It is made of tracts which contain many spicules protruding from them, as well as others which are disposed in all directions. There is much protoplasmic material present. The endosome is characterized by coarse fibers and is more coarsely cavernous than are the ectosomal structures.

The skeleton comprises tracts or fibers which are often as much as 1 mm in diameter, especially near the base of the sponge. They branch repeatedly

* See footnote on page 4.



Text Figure No. 111. Spicule (strongyle) of *Auletta bia,* X 782.

and, therefore, are smaller in diameter near the surface. These contain, and are rendered somewhat plumose by, numerous spicules. These are regarded here as typically all oxeas, but many of them are blunted at one or both ends so that they might almost be called styles or strongyles. These are exceptionally straight and smooth spicules, about 7 μ by 510 μ in dimensions.

This species is set off from others in the genus *Auletta* first of all by the thinness of its spicules, inasmuch as practically all of the sponges of this genus have much thicker megascleres. The peculiar surface also is distinctive. Perhaps the closest species to *bia* is one first described as *Spongia lyrata* by Esper, 1806, page 41. Dendy, 1905, page 194, said that this received in synonymy his *Auletta aurantiaca* published in 1889, page 92, also from Ceylon. Dendy emphasized for the specimens which he saw alive their exceedingly bright orange color, and it also is noteworthy that this species *aurantiaca* or *lyrata* has an hispid surface.

The specific name *bia* is derived from a Greek word meaning "coarse."

GENUS *HOMAXINELLA* Topsent
Homaxinella trachys, new

Text Figure No. 112

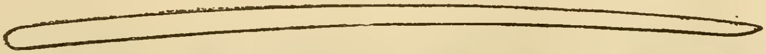
This species is here represented by the following:

U.S.N.M. No. 22990, My No. M. 368, here designated as type, collected July 7, 1949, by diver at Ebon Atoll near the southeast side of the lagoon. The depth was 2 meters, and the substrate was dead coral. On the shoals near the center of the lagoon of Ebon Atoll, dozens of specimens of this species were observed.

The shape is lobate to flabellate, reaching a vertical measurement of 7 cm and a diameter of 4 cm.

The color in life was bright orange to vermillion red, both as to endosome and ectosome. The consistency was stiffly spongy.

The surface is compound rough like that of the preceding species, or like that of the genus *Higginsia,* but has coarser tubercles which are in turn granular or tuberculate. In this species, however, it was possible to make out the pores, which proved to be 80 μ to 180 μ in diameter. They are so close together in the grooves between the tubercles that the barriers between



Text Figure No. 112. Spicule (style) of *Homaxinella trachys,* X 182.

each and the next are narrower than the diameters of the pores. The oscules are 1 mm or a little more than 1 mm in diameter, the exact figure being difficult to state because of their readiness to close. These are few in number, a fairly large specimen having as little as three or four oscules only unless additional ones (being completely closed) were overlooked.

The ectosome, as in the preceding species, is elaborate, characterized by numerous bouquets of spicules, points outward. The endosome contains spongin figers which are extremely plumose, as characteristic of the family Axinellidae, although there is no axial specialization.

The skeleton consists, other than spongin, of spicules of one type only. These are smooth styles, about 16 μ by 550 μ in dimensions.

Most of these species now referred to the genus *Homaxinella* are ramose rather than lobate, and most of them have fairly smooth surfaces, hispid, but not at all like this compound, or *Higginsia*-like type. One species, however, does have this same sort of ectosome. This was described as *Axinella rudis* by Verrill, 1907, page 297, from Bermuda, and transferred to *Homaxinella* by de Laubenfels, 1950, page 87. It here is thought to be very much the closest relative of *trachys*. Its spicules were somewhat smaller, its color much more red, and its shape more ramose.

The species name *trachys* is derived from the Greek word meaning "rough" and refers to the peculiar surface of this species.

Homaxinella phrix, new

Text Figure No. 113

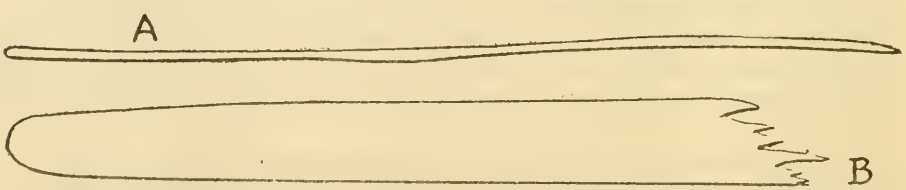
This species is here represented by the following:

U.S.N.M. No. 23080, My No. M. 462, here designated as type, collected August 13, 1949, by hand while wading in very shallow water in the west part of Truk lagoon south of Pollé Islet. The depth was about 30 cm, and the substrate was coral sand.

This is a ramose sponge, with branches 4 to 8 mm in diameter, reaching a height of at least 35 cm. It was very abundant in the type locality.

The ectosome and endosome color in life was yellow, and the consistency is extremely spongy.

The surface is irregular with scattered spots which are very hispid.



Text Figure No. 113. Spicules (styles) of *Homaxinella phrix*, X 782. *A:* One of the smallest size range. *B:* Head only of one of the largest size range.

Other spots are obscured by much debris, especially flakes of mangrove tissue from the nearby mangrove forest. There also were many diatoms present. Even through the microscope the surface appeared to be lipostomous. Evidently the openings are quickly and powerfully closed.

The ectosome and endosome of this species are exaggeratedly like those of the family Axinellidae. There is a central axis about 3 or 4 mm in diameter, consisting of spicules which are arranged longitudinally and are packed rather densely together. Tracts or fascicular bundles of large spicules protrude at right angles in all directions. The bundles are about 1 mm thick and somewhat more than 2 mm apart. In the extensive interstices between these fascicular bundles there are many smaller spicules in confusion and much protoplasmic structure. Although obscured by foreign material and protruding spicules, a thin protoplasmic dermis about 10 μ thick can be discerned over much of the surface.

Study of the skeleton with a microscope reveals that a number of tracts are only 100 μ in diameter. The spicules are all smooth styles, sometimes being subtylostylote. These are of four size ranges. The largest, which protrude away from the central axis and render the surface hispid, are about 14 μ in diameter and several mm long. Portions at least 3 mm long could be found, but none of the longest ones were unbroken so that maximum lengths must be surmised. The spicules packed in the central axis are a little smaller, and those in the interstitial areas are still smaller. Others are as small as 2 μ by 156 μ in dimensions.

There are about five other ramose species now in the genus *Homaxinella,* and all of these are characterized by spicules much smaller than those in the species *phrix.* The nearest in this regard is probably that first described as *Axinella axifera* by Hentschel, 1912, page 418, from the East Indies. The axis of this sponge was described as horny, however, and the spicules are only 19 μ by 880 μ at the maximum.

The specific name is derived from the Greek word meaning "bristling."

GENUS *PARARHAPHOXYA* Burton

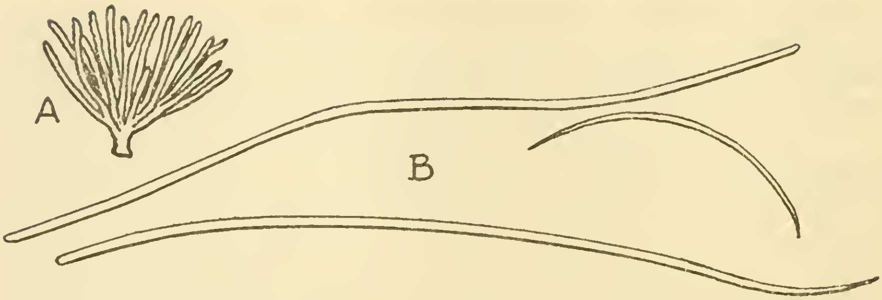
Pararhaphoxya tenuiramosa Burton

Text Figure No. 114

This species is here represented by the following:

U.S.N.M. No. 23062, My No. M. 442, and

U.S.N.M. No. 23063, My No. M. 443, each collected August 3, 1949, by diver in southwest Ponapé in the province of Kiti, near Toletik Islet, from a reef in the lagoon near the shore. The depth was 4 meters, and the substrate in each case was dead coral. These two specimens were collected almost side by side but were selected to show an extreme variation in form and to allow contemplation of subsequent investigation



Text Figure No. 114. *Pararhaphoxya tenuiramosa*. *A:* Sketch of the entire sponge, X ⅓; this is NOT a camera lucida drawing. *B:* Spicules, X 182. The upper one is a strongyle, then a curved oxea, then (below) a style.

as to the possibility that they might be different species. It has been concluded, however, that they are of the same variable species.

The shape of No. M. 442 is ramose with a single stem and branches, but very few of these branches ever branch again. They are 2 to 4 mm in diameter and reach a total length of 11 cm. The shape of No. M. 443 also is stipitate but tends rather to be fan-like or flabellate. It reaches a height of 11 cm and a diameter of 10 cm. Here, as in the preceding specimen, the point of attachment is only about 1 cm in diameter. The many, many leaf-like portions of No. M. 443 are studded with projections about 3 mm in diameter and from only about 1 mm to perhaps 8 or 10 mm in height. It appears as though each of these projections represents an incipient branch of the sort exemplified to the extreme in Specimen No. M. 442.

The ectosome and endosome color in life of both specimens was vivid reddish orange, and the consistency was spongy.

The surface is fairly smooth, but microhispid, and is lipostomous.

The ectosome is almost exclusively protoplasmic, containing a very few spicules indeed, but those which it does contain project somewhat beyond it. Nearly all of the endosome may be described as consisting of a central axial portion; that is to say, the central axis here comprises most of the transverse section of the branch. In No. M. 442, these axial portions appear to be spicular tracts about 400 μ in diameter. Where the branches are the thickest, this is expanded into a less compact structure.

The spicules consist of smooth megascleres, some of them styles and others strongyles. Those which occur in the axial region are much curved. In general, the longer spicules are strongyles and the shorter ones are styles, but these two types do not appear to be localized within the sponge. The sizes vary a great deal—some are 2 μ by 200 μ and others 2 μ by 400 μ, some are 4 μ by 400 μ and some are 4 μ by 600 μ.

Burton, 1934, page 565, describing sponges from the Great Barrier

Reef, northeast of Australia, established *Pararhaphoxya* for the species *tenuiramosa,* which is the only species placed in the genus thus far. Burton found some spicules as large as 14 μ by 1,500 μ, but his description in other respects agrees with these from Ponapé so closely, especially with Specimen No. M. 442, that it is considered inadvisable to erect a new species at this time. The study of further specimens at a later date may indicate the advisability of erection of such a new species.

GENUS *AXINOSIA* Hallman

Axinosia xutha, new

Text Figure No. 115

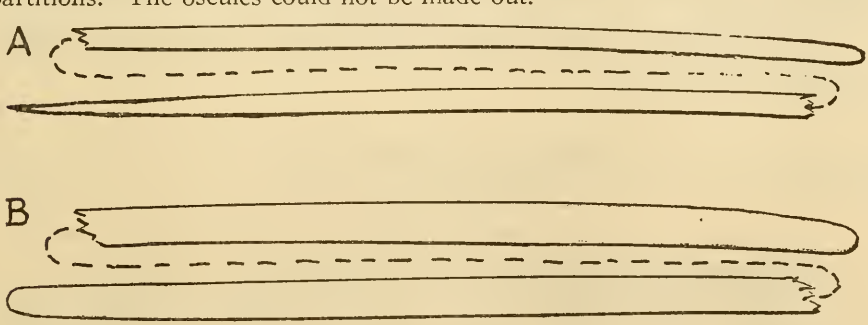
This species is here represented by the following:

U.S.N.M. No. 23097, My No. M. 479, here designated as type, collected August 17, 1949, by diver at Kuop Atoll in the northeast corner of the lagoon to the lee of Givry Islet. The depth was 2 meters, and the substrate was dead coral.

This sponge is an irregular cylinder, perhaps tending in the direction of becoming a fan if it were to continue growth. The diameter is 2.5 by 3 cm, and the vertical measurement 12 cm.

The color in life was bright orange, and amazingly this color is still present after six months in alcohol. Such retention of pigment of orange color in very unusual in the phylum Porifera. The consistency was spongy.

The surface is like that of *Higginsia,* which is to say also like that of *Homaxinella trachys.* About 5 mm apart, center to center, are projections as much as 4 or 5 mm high and about 2 mm in diameter. These projections, which are almost branches, are in turn secondarily granular or tuberculate. The meandering valleys between these projections are smooth, and the valley floor is abundantly dotted with pores, mostly about 50 μ in diameter but varying from 30 μ to 100 μ. There are several for each square mm in the dermal membrane, where they are separated from each other by only narrow partitions. The oscules could not be made out.



Text Figure No. 115. Spicules of *Axinosia xutha,* X 781. *A:* Style. *B:* Strongyle.

The ectosome is set off by extensive subdermal cavities. The dermal membrane is protoplasmic and only about 5 μ thick. It is chiefly aspiculous but does contain some strongyles arranged tangentally. The axial specialization makes up as much as 80 per cent of each projection but forms only a much smaller per cent of the main body of the sponge. In it, the spicules are mostly longitudinal but are crowded. Around this axis, as already noted, there is a zone of extensive subdermal space liberally interspersed with fascicular columns at right angles to the axial specialization. These serve to support the roof, which is the above-mentioned dermal membrane. From ceiling to floor this subdermal space measures slightly over 300 μ.

The skeleton contains some spongin, but it is pale and inconspicuous. The principal spicules present are strongyles, 6 μ by 330 μ. In boiled-out preparations a considerable number of styles also are found. These are thinner, only 3 μ by 330 μ, and there are also quite a number of raphides 1 μ by 300 μ. It is possible that these are merely juvenile forms of the other spicules. In studies of sections, the skeleton in all places consists principally of strongyles. The dermal spicules seem to be exclusively strongyles. The fascicular columns of the ectosomal region are all, or nearly all, strongyles. Certainly, the bulk of the spicules in the solid mass which makes up the axis specialization are strongyles. It cannot be stated with certainty that there is any particular localization of the styles.

The genetic allocation of this species is quite difficult; one is tempted to erect a new genus for it. Externally, it resembles the genus *Ommatosia,* but that genus has no styles at all. In almost every way it is close to the genus *Phakellia,* but in *Phakellia* the structures which are perpendicular to the axial specialization are made up altogether of styles, the strongyles being confined to the axis. Most of those species which have been referred to *Axinosia* emphasize styles and perhaps should not be placed in that genus. Its type is the sponge originally described as *Axinella symbiotica* by Whitelegge, 1907, page 508, from Australia. This is probably the closest other relative of *xutha,* from which it differs chiefly in having spicules much larger, up to 20 μ by 300 μ, and by having dark rather than pale spongin. Also its surface was not so elaborate.

The specific name *xutha* is derived from a Greek word which is thought to mean "orange color."

GENUS *PHYCOPSIS* Carter

Phycopsis terpnis, new

Text Figure No. 116

This species is here represented by the following:

U.S.N.M. No. 23061, My No. M. 441, here designated as type, collected August 3, 1949, by diver from a reef in the lagoon near the shore in

southwest Ponapé, province of Kiti, near Toletik Islet. The depth was 4 meters, and the substrate was dead coral.

This sponge consisted of rounded masses slightly connected to each other as though they had originally been separate but in growing larger had touched each other and so amalgamated. Each of these masses is about 8 cm in diameter.

The color in life blended, in various areas, from dull rose pink to dark dull red. These areas extended down about 4 mm into the sponge but there blended into an endosomal color of dull yellow. The consistency was stiffly spongy.

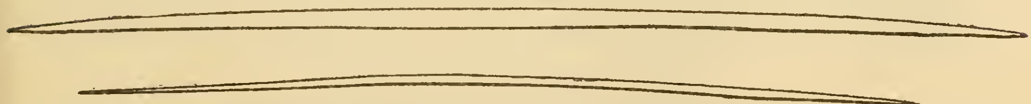
The surface of this sponge is like that in *Higginsia,* extremely compound lumpy. In this complexity, the pores could not be found, but the oscules were conspicuous, 6 mm in diameter and about 4 cm apart.

The ectosome does not give evidence of any detachable dermis, but it is denser in protoplasmic structure and also set off by color from the endosome. The latter also is dense, however, and microcavernous—full of spicules in confusion.

The skeleton consists of long smooth oxeas. Many of these are 17 μ by 730 μ, and so many are 5 μ by 610 μ that this may be regarded as a second category. A considerable number of intermediates exist, however.

According to published descriptions, the genus *Phycopsis* is confined to East Indian and Australian waters. It is founded upon the type specimen *Phycopsis hirsuta* Carter, 1883, page 319, for which species spicule dimensions are lacking. Carter describes it as "shaggy," and this leads one to believe that he had a sponge with a surface somewhat like that of the present specimen. On the following page, Carter also established *Phycopsis fruticulosa,* and again he does not give spicule dimensions. The other species which have been referred to here have had spicules which were either far smaller or far larger than those of *terpnis,* but an outstanding characteristic of the genus is the extent to which all the earlier species involved are rather ill-known or inadequately described.

The specific name here selected is derived from a Greek word meaning "pleasing" and refers to the beautiful coloration of this species.



Text Figure No. 116. Spicules (oxea) of *Phycopsis terpnis,* X 182.

GENUS *PSEUDAXINYSSA* Burton

Pseudaxinyssa pitys, new

Text Figure No. 117

This species is here represented by the following:

U.S.N.M. No. 23103, My No. M. 485, here designated as type, collected September 1, 1949, by diver in Iwayama Bay near Koror in the Palaus. It was found in muddy, discolored water near mangroves at a depth of 2 meters with a dead coral substrate. This species was very common in this particular ecological situation.

The shape of this species is fundamentally massive, but it is provided with abundant processes, about 11 to 14 mm high and 1 to 2 mm thick, situated 4 or 5 mm apart, center to center.

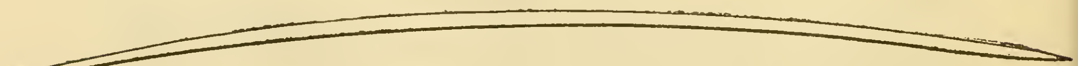
The ectosome and endosome color in life was dirty drab, and the consistency was soft.

The surface, other than the conspicuous projections, was covered with a translucent dermis over large and extensive subdermal cavities. Perhaps this dermis was full of very numerous pores, but by the time the sponge had reached the preserving fluid, these had all closed. The surface is profusely cavernous. Some or all of these openings may represent oscules; but, on the other hand, some of them may be vestibules leading only to pores.

The ectosome structure has already been discussed and consists of the conspicuous projections, the translucent dermis, and the subdermal spaces. The endosome is also cavernous. Its rounded spaces are separated from each other by partitions which contain spicules more or less in confusion.

The skeleton consists principally of spicules with very little spongin. These are long, sharp-pointed oxeas, about 13 μ by 800 μ in dimensions.

The type of this genus was first described as *Axinyssa tethyoides* by Kirkpatrick, 1903, page 245, from South Africa. This seems to have had the same peculiar shape as the species *pitys,* but it was black in color and had large spicules, 34 μ by 700 μ. The sponge first described as *Axinyssa gravieri* by Topsent, 1906, page 563, from the Red Sea, has been referred to *Axinyssa,* but it does not have the peculiar structure. Its spicules were almost the same size as those in *pitys,* but it is noted as colorless in life. Because of the great difference in structure, it is here considered dubious that it should be referred to *Pseudaxinyssa.* The third species so far placed in this genus was first called *Pseudaxinyssa tenuispicula* by Burton, 1931, page 350, from South Africa (like the type). It was based entirely upon a



Text Figure No. 117. Spicule (oxea) of *Pseudaxinyssa pitys,* X 182.

single macerated specimen from which so many things had been lost that any comparison to it must be most uncertain. For example, there may have been microscleres originally present.

The species name here selected is derived from the Greek word meaning "pine tree" and refers to the fact that the projections which cover the surface of this sponge bear a great resemblance to the shape of miniature pine trees.

GENUS *SPONGOSORITES* Topsent
Spongosorites porites de Laubenfels

Text Figure No. 118

This species is not represented by any specimen in the present collection at all but by United States National Museum Specimen No. 22732. It was collected in July, 1946, by R. W. Hiatt, in tidal flats, in the island of Yap, growing on a crab found in holes in dead coral.

This specimen is a rounded mass about 10 mm thick and 15 mm in diameter.

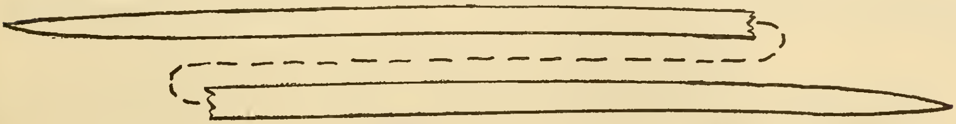
The exterior and interior color in life was black, and the consistency was weakly spongy.

The surface is smooth to the naked eye but is microscopically felted. Its pores are microscopic, chiefly closed, and its oscules barely visible but about 300 μ in diameter when fully opened. About a dozen occur on the specimen.

The ectosome comprises a region about 100 μ thick and is a confusion of many spicules with no flesh. The endosome is dense and only microcavernous.

The skeleton consists of abundant spicules, nearly all oxeas. These are about 6 μ by 300 μ in dimensions. The microscleres probably are to be classified as oxeote but have a bend in the middle so that they vaguely resemble toxas. They range from about 2 μ by 50 μ to 3 μ by 75 μ.

This species was described by de Laubenfels, 1949, page 124.



Text Figure No. 118. Spicule (oxea) of *Spongosorites porites,* X 782.

FAMILY HALICHONDRIIDAE Gray
GENUS *QUEPANETSAL,* new

This genus is here established to have as its type the species *Quepanetsal madidus.* It is sharply characterized by possession of two very distinct types of spicules: one a shorter, thicker strongyle and the other a longer,

thinner oxea. In the type species the latter is microspined near its ends. There are quite a number of species of sponge, particularly in the family Axinellidae, in which there is a tendency for spicules to vary from oxeas to strongyles with intermediates, all actually being of the same category. This is emphatically not the case for the sponge under discussion. Within the family Halichondriidae, the genus most suitable for comparison is *Desmoxya.* Its megascleres vary from oxeas to styles to strongyles, but are not so sharply separated into categories. Its microscleres include trichodragmas and slightly larger raphides, 30 μ to 45 μ long, which are microspined near the end. Attention is called to the exceedingly great difference between these very fine microscleres and the large megascleres of *Quepanetsal,* which are microspined near the ends. The opinion here is expressed that *Quepanetsal* and *Desmoxya* are as far apart as two genera can be and still belong in the same family. *Quepanetsal* has no microscleres at all.

The generic name is from the Latin phrase meaning "both bread and salt," and is suggested by the appearance and consistency of this sponge.

Quepanetsal madidus, new

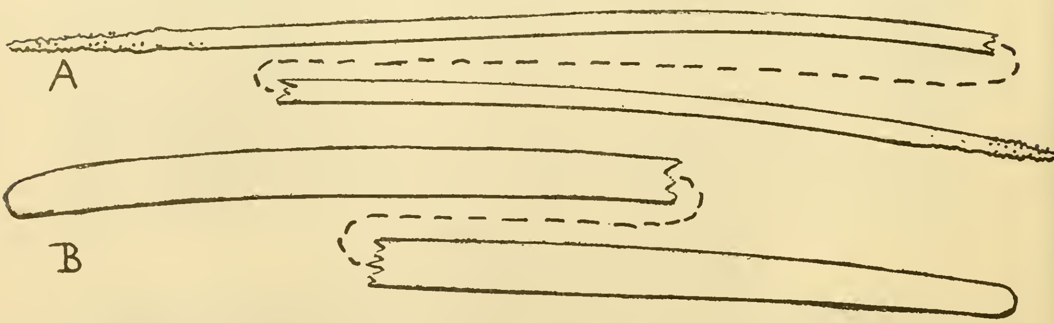
Text Figure No. 119

This species is here represented by the following:

U.S.N.M. No. 22976, My No. M. 352, here designated as type, collected July 5, 1949, by diver from the Pearl Pool in the western portion of the lagoon at Ebon Atoll. The depth was 3 meters, and the substrate was dead coral.

This species grew indefinitely in all directions in the interstices of a mass of dead, bush-shaped coral. Fragments of sponge tissue as large as 3 cm diameter could be extracted with some difficulty.

The ectosome and endosome color in life was almost white, and the consistency was very soft and crumbling like wet bread.



Text Figure No. 119. Spicules of *Quepanetsal madidus,* X 782. *A:* Oxea with microspined ends; the entire spicule is shown, but in two parts. *B:* Strongyle; the entire spicule is shown, but in two parts.

The surface was very even and abundantly provided with pores, 60 μ to 70 μ in diameter. These are closeable with a sphinctate membrane. The oscules could not be found with certainty.

The ectosome consists of a special dermal structure, its spicules tangentally placed. It is easily removed and underlain by extensive subdermal cavities, as characteristic of the Halichondriidae. The endosome, as in the species *Halichondria,* is like bread—in this particular case, like water-logged or soaked bread. It contains a considerable quantity of filamentous algae about 10 μ in diameter and indefinitely long. Its spicules are in confusion.

The skeleton consists of megascleres of two categories, which are not definitely located in separate parts of the sponge. There are strongyles, 8 μ by 225 μ, and there are long, sharp-pointed oxeas, varying from 1 μ by 300 μ to 4 μ by 300 μ in dimensions. These, especially the larger ones, are very finely roughened, especially near the ends.

The comparative relationships of the species have been discussed in connection with the generic description.

The species name is derived from the Latin word meaning "wet."

GENUS *HALICHONDRIA* Fleming

Halichondria adelpha new

Text Figure No. 120

This species is here represented by the following:

U.S.N.M. No. 22859, My No. M. 153, here designated as type, collected July 7, 1949, by diver from the open ocean near the shore at Rubé point at Ebon Atoll. The depth was 3 meters, and the substrate was dead coral.

U.S.N.M. No. 22805, My No. N. 010, collected April 25, 1946, by J. P. E. Morrison at Bikini Atoll in the central portion of the lagoon, 7 kilometers south of the west end of Bikini Islet. It was dredged from a depth of 50 meters. It seems clearly to be an *Halichondria,* but the allocation to *adelpha* is conjectural. The specimen is so small that it cannot be regarded as well known.

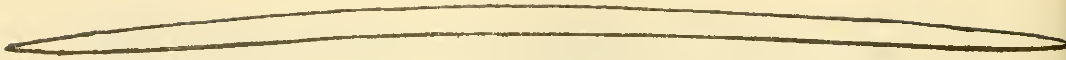
The following description applies to the type specimen.

This sponge is incrusting, 7 mm thick, extending laterally about 3 cm.

The exterior and interior color in life was vivid orange and the consistency rather mediocre.

The surface is comparatively level, but abundantly supplied with minute pits which are about 50 μ in diameter. These almost certainly represent the locations of pores which have closed. There are no separations distinguishable between exhalant and inhalant apertures.

The ectosome consists of tangent spicules, in a protoplasmic basis, making a very definite dermis over subdermal spaces, as characteristic of the



Text Figure No. 120. Spicule (oxea) of *Halichondria adelpha,* X 782.

genus *Halichondria.* The endosome is equally typical of the genus, being somewhat like crumb-of-bread; small caverns or chambers are surrounded by spicules in confusion.

The skeleton consists of long fusiform oxeas of great size variation, many at least as large as 5 μ by 185 μ.

Very numerous species have been described as of the genus *Halichondria,* perhaps as many as 200 in all. Of these, the largest fraction have been since properly removed, because they never should have been put in *Halichondria.* Those of the next largest fraction are quite hopelessly unrecognizable. Still another considerable fraction, when the time comes for revision of the genus, will need to be removed from *Halichondria.* It is here considered probable that a rather small number of species will then be left, but the very large task of revising the genus is not attempted here. Small differences can be found between *adelpha* and any other species now located in *Halichondria,* but the comparison may best be made to the type of the genus, *Halichondria panicea,* first described as *Spongia panicea* by Pallas, 1766, page 388. This is often orange in color but never so vivid an orange as *adelpha.* It is regularly characterized by conspicuous oscules. Attention is here called to the astonishingly lipostomous condition of the species *adelpha.*

The name is derived from the Greek word meaning "sisterly" to indicate that it is a relative of *panicea.*

GENUS *NAILONDRIA,* new

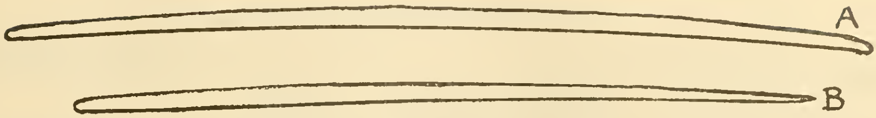
This genus is here established in the family Halichondriidae, to have as type the following species, *Nailondria maza.* It is characterized by having a spiculation of strongyles and styles, and in this respect is unique in the family. Other than the peculiar spiculation, the structure is very much like the genus *Halichondria* itself. The name selected might be considered to be an arbitrary combination of letters, but the latter portion of the name is derived from the word Halichondria, and "Nai" is a Greek affirmative.

Nailondria maza, new

Text Figure No. 121

This species is here represented by the following:

U.S.N.M. No. 23083, My No. M. 465, here designated as type, collected August 13, 1949, by hand while wading in the western portion of the Truk lagoon south of Pollé Islet. This was near a large number of



Text Figure No. 121. Spicules of *Nailondria maza,* X 182. *A:* Strongyle. *B:* Style.

mangroves, in very shallow, darkly discolored water, at a depth of only 30 cm. The substrate was coral sand. Several other specimens of the same sort were noticed in the vicinity. The shape is amorphous, reaching a diameter of 15 cm.

The color of the ectosome in life was chiefly yellow. In places it was green, but the latter was probably due to algae. The endosome was only yellow. The consistency was soft, very much like that of wet, soggy bread.

The surface is smooth, with a conspicuously separable dermis, abundantly provided with pores, 50 μ to 100 μ in diameter and 60 μ to 160 μ apart, center to center. The oscules are also fairly conspicuous, about 5 mm in diameter and 3 cm apart.

As already noted, the ectosome comprises a conspicuously separable dermis, which contains abundant spicules tangentally arranged. The endosome is cavernous with spicules in confusion around small chambers which are often as little as 100 μ in diameter but in some cases are much larger.

The skeleton consists of two types of megascleres. There are styles, about 12 μ by 540 μ in dimensions, which predominate in the ectosome. There are strongyles, 12 μ by 630 μ in diameter, and which are found chiefly in the endosome; but even here they are not quite as numerous as the styles.

The peculiar specific characteristics already have been discussed in connection with the generic description.

The specific name here selected is derived from a Greek word for a sort of cake, referring both to the appearance of the whole sponge and to the consistency which it exhibits..

GENUS *CIOCALAPATA* de Laubenfels

Ciocalapata sacciformis (Thiele) de Laubenfels

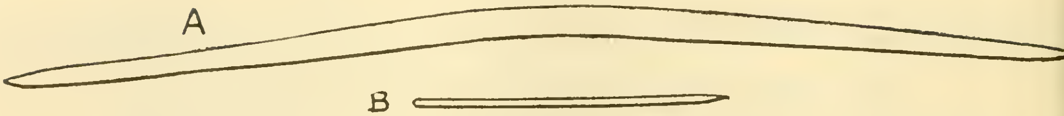
Text Figure No. 122

This species is here represented by the following:

U.S.N.M. No. 22926, My No. M. 232, collected September 1, 1949, by divers in Iwayama Bay near Koror in the Palaus. The depth was 2 meters, and the substrate was dead coral.

This is an irregular mass, 6 cm thick and 12 cm in diameter.

The exterior color in life was a dirty white, but the interior was pale green. The consistency was crisp, like a raw potato, not spongy; it was neatly and easily cut.



Text Figure No. 122. Spicules of *Ciocalapata sacciformis,* X 182. *A:* Oxea. *B:* Style.

The surface is level and punctiform with obvious skeletal pores, 300 μ in diameter, about one for each square mm. These in turn are covered with a thin membrane, which is pierced by about 4, 5, or 6 real pores, the latter being 60 μ to 80 μ in diameter. The exhalant openings could not be differentiated from the similar inhalant openings in this case.

The ectosome is characterized by relatively enormous subdermal spaces with a roof held up above them by fascicular columns. This space is often as much as 500 μ high. Its roof, often more than 100 μ thick, is abundantly provided with tangental spicules and fleshy structures. The endosome is crumb-of-bread type with many gross cavities, spicules in confusion, and very little protoplasm.

The skeleton has been described above to some extent, but comment should be made on the further existence of vague spicule-filled tracts, about 100 μ in diameter. The spicules include oxeas of great size range, some as large as 21 μ by 800 μ, and styles also varying greatly in size, some as large as 6 μ by 220 μ. Both sorts occur commonly in the dermis, and both sorts occur commonly in the interior of the sponge.

Thiele, 1900, page 76, described *Ciocalypta sacciformis* from the East Indian region, and de Laubenfels, 1936, page 134, transferred this to *Ciocalapata.* The species was recorded further by Hentschel, 1912, page 425, also from the East Indian region. It is probably a common species. Most of the other specimens in the literature are described as sac-like or hollow tubes or folded plates. The fact that this specimen from the Palaus is an irregular mass may be due to environmental conditions. In view of this likelihood, it is not thought worthy of specific separation because of its shape.

FAMILY SEMISUBERITIDAE de Laubenfels
GENUS *RHAPHISIA* Topsent
Rhaphisia hispida, new

Text Figure No. 123

This species is here represented by the following:

U.S.N.M. No. 22879, My No. M. 176, here designated as type, collected July 30, 1949, by diver in the lagoon near the shore at northwest Ponapé. The depth was 2 meters, and the substrate was dead coral.

This is a very thin incrustation. Its thickness is 3 mm plus the hispidating spicules. The diameter is about 15 cm.

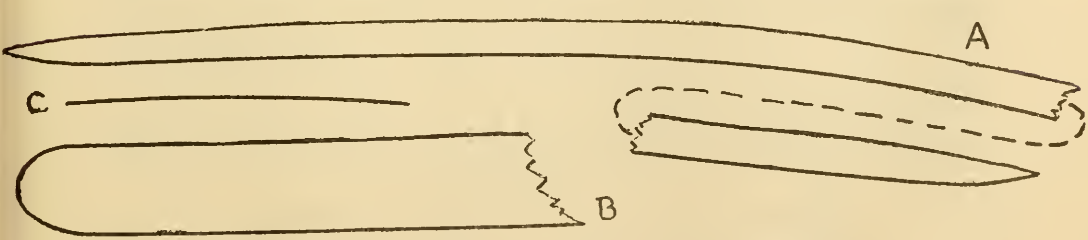
The color in life was orange; and the consistency, other than that of the obvious spicules, was a softly colloidal sol.

The surface is lumpy and hispid with optically evident spicules protruding at least 3 mm beyond the surface. These are not close together as in plush or velvet but are separated from one another by about 200 μ. No pores nor oscules could be made out.

There is little or no ectosomal specialization, and the endosome is chiefly protoplasmic, other than the spicules which may be described under the heading of skeleton.

The skeleton consists primarily of enormously long megascleres, consistently about 15 μ in diameter. These stand perpendicular to the substratum, run through the entire thickness of the sponge, and protrude about 3 mm beyond its surface, so that the total length is about 5, 6 or even 7 mm. Most of these spicules were broken in the process of making mounts for microscopical study. A very few which were not broken proved to be strongyles, but inasmuch as numerous of the fragments showed pointed ends, it must be that some of the spicules are styles or even oxeas. In any case, these are all of the same category. A second type of spicule is a somewhat bent, smooth, sharply pointed oxea, about 7 μ by 255 μ. Spicules of this type are strewn in confusion inside and throughout the flesh of the sponge. The microscleres are trichodragmas, individual raphides of which are about 0.3 μ by 60 μ in dimensions.

This species *hispida* constitutes a fifth for the genus and is sharply set off by the enormous length of the larger category of spicules. In the other species these do not exceed 1 mm at the most. *Rhaphisia ambrosia* de Laubenfels, 1936, page 135, from the West Indies, lacks the trichodragmas. *Rhaphisia laxa* Topsent, 1892, page xvii, from the Mediterranean, the type of the genus, lacks the longer category of spicules. *Rhaphisia ramosa* Whitelegge, 1906, page 463, from Australia, is unique in the genus for having ramose or clathrous form; all its spicules are quite small as compared to the others in the genus. A fourth species was first described at *Thrinocophora spissa* by Topsent, 1892, page 124, and was referred to *Rhaphisia* by the



Text Figure No. 123. Spicules of *Rhaphisia hispida,* X 182. *A:* Oxea; the entire spicule shows, but in two parts. *B:* Head region only, of strongyle or style. *C:* Raphide, from the trichodragmas.

same author, 1894, page 5. In addition to the other three types of spicules, this species from the North Atlantic has a curious curved microsclere, 220 μ long, which is almost a sigma, and almost a toxa.

The name *hispida* is selected obviously, because of the extreme hispidation of this sponge from Ponapé.

GENUS *KATIBA*, new

This genus is here established in the family Semisuberitidae, to have as genotype the species *Katiba milnei.* This genus is here described as having no certain megascleres at all, but all its spicules so small that they are within the size range of ordinary microscleres. They are entirely diactinal and arranged in confusion. All the specimens studied are persistently incrustations. Perhaps the nearest genus is *Rhaphisia,* but this latter genus has normal or larger than normal megascleres. The generic name selected is given in consideration of Katib, the eminent native inhabitant of Ebon Atoll, capable of extraordinary feats of under-water swimming and of diving, in appreciation of his untiring and efficient help in securing the collection upon which much of the present treatise is based.

Katiba milnei, new

Text Figure No. 124

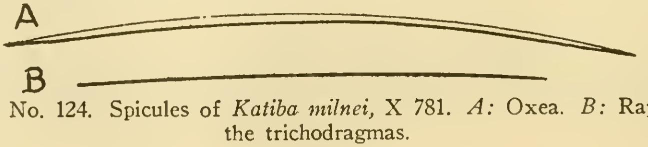
This species is here represented by the following:

U.S.N.M. No. 22984, My No. M. 362, here designated at type, collected July 5, 1949, by diver Katib in the miniature lagoon at the south corner of the lagoon at Ebon Atoll. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 22849, My No. M. 143, collected the same day and in the same general locality. This species appeared to be rather common in this portion of the Ebon Atoll lagoon.

This sponge is incrusting and seldom as much as 3 mm thick, often less than 1 mm thick. It sometimes spreads in all directions uniformly, but more often it takes the shape of repent ribbons, as much as 15 cm long and 2 to 7 mm wide. It is exceptionally difficult to detach it from the underlying and very uneven surface of the coral.

The interior and exterior color in life was a pale, beautiful cerulean blue, and the consistency was fragile and very soft.



Text Figure No. 124. Spicules of *Katiba milnei,* X 781. *A:* Oxea. *B:* Raphide, from the trichodragmas.

The surface is even and punctiform. Some of the openings, which may be as large as 180 μ by 280 μ, perhaps are oscules; and others, which range from 15 μ to 30 μ in diameter, are the true pores. These are sometimes but not always aggregated into clusters, as much as 200 μ in diameter. In some cases the cluster looks like a large pore covered by a sieve.

The ectosome is much more densely fleshy than the endosome, but the subdermal cavities are only moderately noticeable. The endosome is primarily colloidal in structure, but there are rather conspicuous flagellate chambers, 30 μ to 35 μ in diameter.

The skeleton consists of spicules in confusion, but all are exceedingly small. The largest are microxeas, 1.2 μ by 80 μ to 1 μ by 110 μ. There are also exceedingly abundant trichodragmas, the individual raphides of which are 0.3 μ by 80 μ to 0.4 μ by 50 μ.

The distinctive features of the species are included in those of the genus, this being the first species of the genus.

The name here selected refers to the family Milne, various individuals of which lived in the region studied and contributed materially to the making of the collection upon which this treatise is based. Special attention is called to two outstandingly capable natives of the Marshall Islands. They are cousins, each named James Milne.

FAMILY HYMENIACIDONIDAE de Laubenfels

GENUS *HYMENIACIDON* Bowerbank

Hymeniacidon aldis, new

Text Figure No. 125

This species is here represented by the following:

U.S.N.M. No. 22940, My No. M. 310, here designated as type, collected June 20, 1949, by diver at Ailing-lap-lap Atoll from the channel near Bikájela Islet. The depth was 10 meters, and the substrate was dead coral.

This is an irregularly columnar specimen, 1.3 cm in diameter and 2.8 cm high.

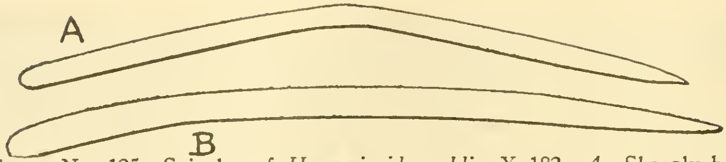
The exterior and interior color in life was bright orange, and the consistency softly spongy.

The surface is microconulose and lipostomous.

The ectosome consists only of a very thin fleshy dermis. The endosome is primarily protoplasmic but contains a jumble of spicules in confusion, showing a vague plumose arrangement.

The skeleton consists entirely of smooth thick styles, often somewhat bent. The sizes range from about 14 μ by 500 μ to 20 μ by 500 μ.

This is a dubious and puzzling specimen. The generic allocation is far from certain. Consideration must be paid to the possibility that it is an ab-



Text Figure No. 125. Spicules of *Hymeniacidon aldis,* X 182. *A:* Sharply bent style. B: Commonplace style.

normal specimen of *Stylotella agminata* in the family Suberitidae. Against this possibility it may be stated that *aldis* has no fiber, the surface is not Suberitid, and the spicules are very much thicker than those in *agminata.* The genus *Hymeniacidon* stands in considerable need of revision, being at present overburdened with species names. In general, the many species described from North American and European waters have spicules much smaller than those of *aldis.* The fairly numerous species described from the Indian Ocean and East Indian region do have rather thick spicules. If more specimens become available and further study is made, it may prove ultimately to be necessary to reduce in synonymy not merely *aldis* but a number of others now in the literature.

The name *aldis* is selected primarily for euphony but is derived (by very extensive alteration) from the Greek word *aldaino* meaning "to grow, wax or thrive."

Hymeniacidon dystacta, new

Text Figure No. 126

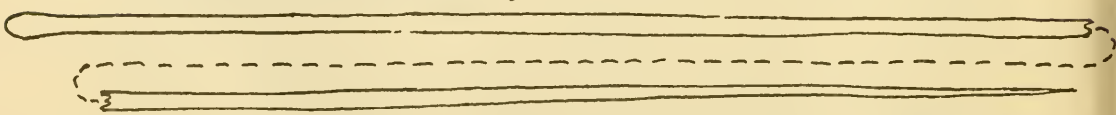
This species is here represented by the following:

U.S.N.M. No. 22852, My No. M. 146, here designated as type, collected on July 5, 1949 by a diver from the miniature lagoon at the southwest corner of the main lagoon at Ebon Atoll. The substrate was dead coral.

U.S.N.M. No. 22798, My No. N. 003, collected on April 25, 1946, by dredging 7 kilometers south of the west end of Bikini Island, in the lagoon of Bikini Atoll at a depth of 50 meters. The collector was J. P. E. Morrison.

U.S.N.M. No. 22803, My No. N. 008, with the same collection data as the preceding specimen.

U.S.N.M. No. 22826, My No. N. 033 collected on July 11, 1946, by dredging 5 kilometers off Bikini Island in the lagoon of Bikini Atoll at a depth of 50 meters. The collector was J. P. E. Morrison.



Text Figure No. 126. Spicule (tylostyle) of *Hymeniacidon dystacta,* X 781. The entire spicule is shown, but in two parts.

This species occurs in vaguely laminate or lobate, almost amorphous masses, usually taller than wide. The height is often 6 to 8 cm, and the diameters under 6 cm.

The color in life of my specimens was orange, that of Morrison's specimens is not known. The consistency was mediocre, easily torn.

The surface is somewhat uneven in some places and smooth, almost conulose elsewhere. The specimens appear to be lipostomous.

The ectosome is a fleshy dermis, detachable only with difficulty and in small bits. The endosome is chiefly in confusion, but vague tracts can be found, 70 μ to 200 μ in diameter, branching and reuniting at acute angles.

The skeleton comprises numerous spicules of great variation in size. These are nearly always styles, but some show faint indications of elongate heads, almost as in tylostyles. The sizes range from at least as small as 0.5 μ by 80 μ up to at least 4 μ by 170 μ or 3 μ by 260 μ.

The relationship between *Hymeniacidon* and *Stylotella* still awaits more evidence and study. My first impression was that the Ebon specimen was a juvenile *Stylotella agminata,* but it and the many Bikini specimens clearly conform to the definition of *Hymeniacidon.* They are not at all close in resemblance to most immature sponges of the family Suberitidae, whereas *Stylotella* is regarded as being in this family. Old Suberitids commonly show the characteristics which *Stylotella* possesses, especially the coarse, woody fibers. Thus, one would expect juvenile *Stylotella* to resemble other immature Suberitids and not the specimens which are now being considered. In the Carolines I found many small *Stylotellas* which were obviously immature, and they were very different from *aldis* and *dystacta.*

Hymeniacidon dystacta is more like species of this genus from Europe, such as *H. caruncula,* than like others which have been described from the Pacific. The latter have spicules far larger than those of *dystacta,* and therefore are (in this respect) more like *Stylotella* than is *dystacta.* On the other hand, *caruncula's* spicules are much shorter than those of *dystacta.*

The species name selected is taken from the Greek, meaning "difficult to classify."

GENUS *NEOPROSYPA,* new

This genus is here established in the family Hymeniacidonidae, to have as type the new species *Neoprosypa atina.* It may be defined as having a spiculation of oxeas and styles accompanied by trichodragmas—with the further remarkable circumstance that all or nearly all of the megascleres are completely acanthose. This, therefore, reads on paper as though the genus should be placed in the family Acarniidae of the Poecilosclerina. On the other hand, the spicules of the members of this latter family are coarsely spined, whereas the species *atina* has only very fine spines on the spicules. But for

this spination, it is rather close to the genus *Oxeostilon* in the family Hymeniacidonidae. It is further separated from *Oxeostilon* by the possession of trichodragmas, which *Oxeostilon* lacks.

Neoprosypa atina, new

Text Figure No. 127

This species is here represented by the following:

U.S.N.M. No. 22974, My No. M. 350, here designated as type and

U.S.N.M. No. 22975, My No. M. 351. Both of these were collected on July 5, 1949, by diver, from the Pearl Pool near the western portion of the lagoon at Ebon Atoll. The depth was 1 to 3 meters, and the substrate was dead coral.

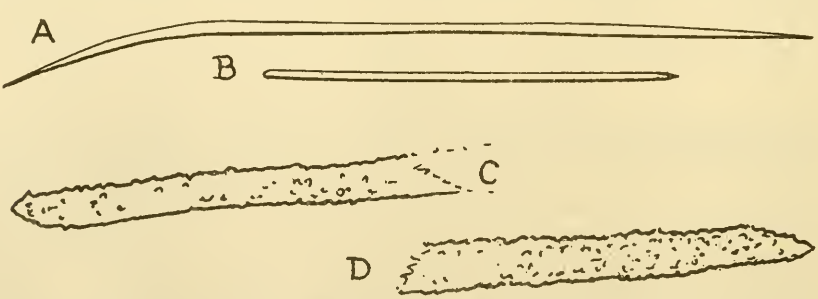
This sponge is one of those which fill in the interstices of bushlike or ramose dead coral. With some difficulty it was possible to excavate a fragment of only sponge as much as 3 cm in diameter; larger specimens always would contain considerable coral.

The color in life was bright yellow, the interior being somewhat duller than the exterior. The consistency was soft.

The surface varies from smooth to smoothly undulating and is ostensibly lipostomous, but it is possible to see where pores have been closed by membranes pulled across them. These are about 80 μ in diameter. Oscules could not be made out as distinct from inhalant openings.

The ectosome is a fleshy dermis, but not easily detached because of the rarity of subdermal cavities. Spicules project from it here and there, but not close enough together so that the adjective hispid should be implied. The endosome is rather crumb-of-bread, or micro-cavernous, in nature.

The skeleton consists principally of megascleres in confusion. These are styles, 6 μ by 300 μ, and oxeas, 7 μ by 600 μ in dimensions. Each kind is profusely covered with minute spines, or rugosities. Each spine is rather less



Text Figure No. 127. Spicules of *Neoprosypa atina. A:* Oxea, X 182. *B:* Style, X 182. *C:* Head of style, X 781, showing the rugose surface. *D:* Pointed end of style, X 781. The raphides (from trichodragmas) are not shown.

than 1 μ in total elevation and, therefore, easily overlooked. There does not seem to be any localization of the spicule types within the sponge. The microscleres consist of trichodragmas of which the individual raphides are about 0.3 μ by 35 μ.

The specific characters were treated above in connection with the generic description.

The species name is selected for euphony but was suggested by the fact that it is a popular feminine name among the natives of Ebon Atoll.

GENUS *DENSA* de Laubenfels

Densa mollis, new

Text Figure No. 128

This species is here represented by the following:

U.S.N.M. No. 23076, My No. M. 457, here designated as type, collected August 10, 1949, by diver from the vicinity of Moen Islet in Truk lagoon. The depth was 2 meters, and the substrate was dead coral.

This is an incrusting sponge, 4 mm thick and about 10 cm in lateral dimensions.

The endosome and ectosome color in life was vivid yellowish brown, and the consistency extremely soft.

The surface is punctiform, owing to the fact that the pores are often in groups about 1 mm apart and 200 to 300 mm in diameter. In each of these groups, the individual pores are 65 μ to 130 μ in diameter but are crowded closely together so that the partitions between them are narrower than the width of the pores themselves. The oscules could not be made out as distinct from the inhalant openings.

The ectosome shows no specialization other than a protoplasmic thickening, and the endosome is in great confusion.

The skeleton consists of oxeas strewn in utter confusion throughout the endosome with no fibers nor tracts. These are long smooth oxeas, 2 μ by 140 μ to 2.5 μ by 137 μ in dimensions.

Special comment should be made on the relatively enormous quantity of colloidal material in this sponge. In staining material for slides with safranin less than half of the sponge material took the dye stuff at all. Even with haematoxylin, much of this yellow colloid remained quite unstained.

At the present time there is only one other species in the genus *Densa*. This is *Densa araminta* de Laubenfels, 1934, page 14, from the West Indies.

Text Figure No. 128. Spicule (oxea) of *Densa mollis,* X 781.

This sponge was greenish black in life and not so liberally provided with colloidal material.

The specific name refers to the very soft structure of this species from Truk.

GENUS *PRIANOS* Gray

Prianos phlox, new

Text Figure No. 129

This species is here represented by the following:

U.S.N.M. No. 22936, My No. M. 306, here designated as type, collected June 11, 1949, by hand while wading at Ailing-lap-lap Atoll in the southern portion of the lagoon near Bikájela Islet. The depth was about 30 cm, and the substrate was dead coral.

U.S.N.M. No. 22836, My No. M. 119, collected June 28, 1949, by diver, at Majuro Atoll from the north side of the lagoon near Enemanok Islet. The depth was 2 meters, and the substrate was the under side of an upside-down enameled dinner plate. The specimen is atypical and may be juvenile, but is here placed with others of this species.

U.S.N.M. No. 22866, My No. M. 160, collected July 11, 1949, by diver, at Likiep Atoll in the southeast corner of the lagoon near the church. The depth was 3 meters, and the substrate was dead coral.

This species is probably rather common throughout the Marshall Islands; but, being very small, most of the specimens are overlooked or found impossible to collect.

The shape is incrusting, and the size quite small. Some of the crusts are as much as 2 mm thick and show indefinite lateral growth, but specimens the size of a coin are the rule.

The color in life was bright orange, and the consistency was soft, somewhat slimy.

The surface is usually smooth, though here and there a few regions may be a little bit lumpy. It is quite lipostomous.

The ectosome is characterized by a thin fleshy dermis, and the interior chiefly by spicules in confusion. There is, however, a very loose, open, irregular reticulation of vague tracts, usually not more than two spicules per cross section, connected to one another by a small quantity of what may be spongin.

The skeleton consists exclusively of strongyles. Some juvenile spicules may be mistaken for oxeas, but are probably just developmental forms. These spicules reach a size of 7 μ by 470 μ, but smaller ones of all sizes are fairly common.

Text Figure No. 129. Spicule (strongyle) of *Prianos phlox,* X 182.

The genus *Prianos* is represented rather well in waters of the Mediterranean and western European regions where its type was first described as *Reniera cratera* by Schmidt, 1862, page 73. In 1864, page 38, Schmidt described it again from almost the same region, this time calling it *Reniera amorpha.* Bowerbank described it from English waters in 1874, page 243, as *Desmacidon columella.* The resemblance of this to *amorpha* was pointed out by de Laubenfels, 1932, page 52. The latter author, 1930, page 26, described *Prianos problematicus* from the coast of California. The European species has spicules much thicker but shorter than those of the Pacific form, here first described. The California specimen, from the eastern Pacific, has very much smaller spicules than either of the others and, in addition, contains what seems to be oxeas. These may be merely developmental forms, as in *Prianos phlox,* but the possibility exists that they might be raphides of a distinctive category and thus gave rise to the name *problematicus.*

The name *phlox* was selected for this new species from the western Pacific, because of its unique bright flame-red or orange color.

Prianos melanos, new

Text Figure No. 130

This species is here represented by the following:

U.S.N.M. No. 22985, My No. M. 363, here designated as type, collected July 5, 1949, by diver at Ebon Atoll in the miniature lagoon at the south corner of the lagoon. The depth was 2 meters, and the substrate was dead coral. It was very common in this vicinity.

This is an incrusting form, about 0.6 mm thick, consisting of many patches of indefinite lateral growth.

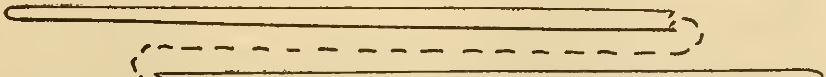
The color in life was shiny jet black. The consistency was a colloidal sol.

The surface is shiny smooth and quite lipostomous.

Ectosome and endosome structures are merely in confusion, with protoplasm mingled with spicules.

The skeleton consists entirely of straight strongyles, 3 μ by 227 μ in dimensions. A few smaller ones are undoubtedly juvenile.

The genus *Prianos* has been outlined in connection with the discussion of *Prianos phlox.* The present species is set off from the others most particularly by its color, but it has a very small size of spicule as an additional characteristic. In fact, its skeleton is so scanty that doubt may arise as to the generic al-



Text Figure No. 130. Spicule (strongyle) of *Prianos melanos,* X 781. The entire spicule is shown, but in two parts.

location. For instance, this might belong in the family Desmacidonidae instead of in the family Hymeniacidonidae. In the family Desmacidonidae, however, the genus which is sharply set off by having a spiculation of only strongyles is *Liosina,* and it shows a pronounced tendency to resemble keratose sponges, having a considerable amount of spongin and a tendency to grow strongly in a vertical direction.

The species name here selected obviously refers to the black color.

Prianos osiris, new

Text Figure No. 131

This species is here represented by the following:

U.S.N.M. No. 23078, My No. M. 460, here designated as type, collected August 13, 1949, by diver in the western portion of the Truk lagoon south of Pollé Islet near mangroves, in water discolored dark brown by the vegetation. The depth was less than 2 meters, and the substrate was fragments of dead coral.

This species can be described as almost cylindrical but exceedingly lumpy and irregular in outline. The mass reaches a height of 12 cm and a diameter of 7 cm.

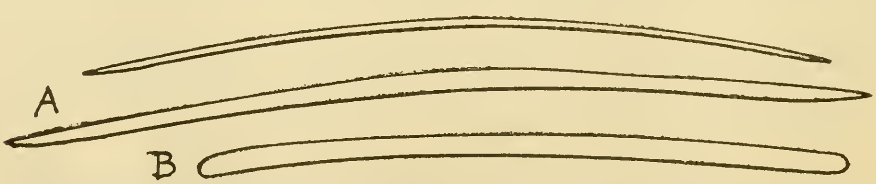
The endosome and ectosome color in life was orange and the consistency very soft.

The surface was even but thrown into tubercles often only about 200 μ high, 1 mm in diameter, and 2 mm apart. There were also the larger irregularities which have been mentioned in the description of the shape of the species. The pores are about 30 μ to 60 μ in diameter and are quite abundant in the grooves between the tubercles where they may be as little as 70 μ apart, center to center. The oscules are about 5 mm in diameter and 7 cm apart.

The ectosome is detachable with some difficulty and is about 50 μ thick. It is chiefly fleshy in construction. The endosome is mostly in confusion.

The skeleton consists of: strongyles, 4 μ by 112 μ; oxeas (about equally abundant), 3.5 μ by 150 μ; and smaller spicules, which are either oxeas or raphides (very abundant), 1 μ by 134 μ.

It is here suggested that the genus *Prianos* falls into two subdivisions, which might be described as subgenera. The typical one contains *cratera* and



Text Figure No. 131. Spicules of *Prianos osiris,* X 781. *A:* Two of the oxeas. *B:* Strongyle.

phlox. The other subgenus contains *problematicus* from California, and this species *osiris*, from the west Pacific. The strongyles of *osiris* are much smaller than those of *problematicus*, and its oxeote spicules are much longer. Its raphide-like category is much more conspicuous and abundant. The species *melanos* does not fit well into either of these two hypothetical subgenera.

The species name here selected is that of an ancient Egyptian deity and has no descriptive significance.

GENUS *DICTYONELLA* Schmidt

Dictyonella dasyphylla, new

Text Figure No. 132
Plate VII, Figure b

This species is here represented by the following:

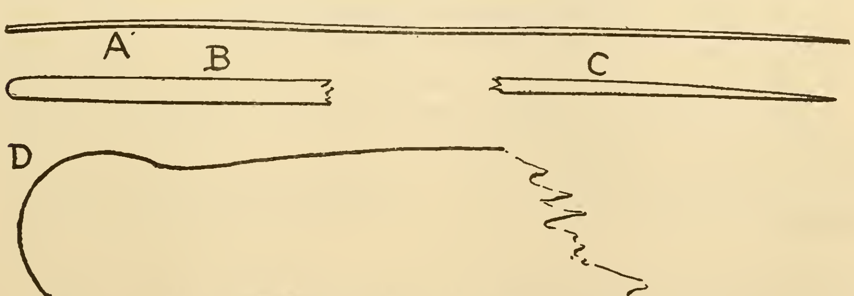
U.S.N.M. No. 23102, My No. M. 484, here designated as type, collected September 1, 1949, by divers in Iwayama Bay, near Koror in the Palaus. This was in muddy water discolored with vegetable material and was near mangroves. The depth was 2 meters, and substrate was dead coral.

This is an elaborate sponge, between ramose and lamellate, the branches being flat. It reaches a vertical measurement of at least 10 cm, and the leaflike lobes are 1 to 2 mm thick and about 10 mm wide.

The exterior color in life was dark slaty gray, and the interior was dark dull green. The consistency was spongy.

The surface is coarsely hispid, with enormous spicules protruding 3 to 4 mm above the surface, about 1 mm apart. The pores and oscules cannot be made out.

The ectosomal specialization is merely a thin fleshy dermis, not separable, and the endosome is chiefly fleshy with the spicules more or less in confusion. It cannot be said even that the points are always directed towards the surface.



Text Figure No 132. Spicules of *Dictyonella dasyphylla*. *A:* Style, X 182. *B* and *C:* Style of the smaller size range, X 781; the mid portion is not shown, only the terminations. *D:* Head of one of the larger monaxon megascleres, showing a subtylostylote condition, X 781.

Even the hispidating spicules occasionally have the blunt end out, although the conventional placement is more common.

The skeleton consists of monaxon spicules of two conspicuously different size ranges. The larger size are styles to subtylostyles; the diameter of the heads is scarcely any greater than the diameter of the thickest portion of the shaft. These reach a thickness of 28 μ to 30 μ and a length of between 5 and 6 mm. They are perpendicular to the surface and constitute the hispidation which is described above. The spicules of the second category are strewn in confusion between the larger ones; in the flesh they are exclusively styles, 4 μ by 640 μ in dimensions.

The genus *Dictyonella,* as of the time of writing, comprised some six species names, all from the Mediterranean region and all for specimens very much like each other. Thus, it is here considered that only a single species is really represented. This first was called *Acanthella obtusa* by Schmidt, 1862, page 65, and referred to *Dictyonella* by Topsent, 1938, page 10. This European species is more or less orange, whereas the one from the western Pacific is slate over green. The European species is scarcely hispid at all, in contrast to the conspicuous hispidation of this new species. The European *Dictyonella* has monaxons of only one size range, exclusively styles, where the present species has subtylostyles in part and definitely two size ranges. The spicules of *dasyphylla* also are much larger than the largest of any of the European forms.

The specific name here selected is derived from the Greek words for "shaggy" and "leaf" and is descriptive of the appearance of the sponge in question.

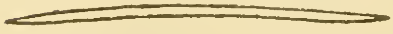
GENUS *HOPLOCHALINA* Lendenfeld

Hoplochalina agoga, new

Text Figure No. 133

This species is here represented by the following.

U.S.N.M. No. 23126, My No. M. 508, here designated as type, collected September 2, 1949, northwest of Koror in the Palaus near Ngarebagal Islet. The depth was 3 meters, and the substrate was dead coral. Only the one specimen was found.



Text Figure No. 133. Spicule (oxea) of *Hoplochalina agoga,* X 182.

This is a subspherical sponge, 4 cm in height and 5 by 6 cm in lateral dimensions.

The color in life was a lovely rose red, verging slightly towards purple. The endosome, in contrast, was paler pinkish rose, not at all purplish. The consistency was spongy, emitting a great deal of slime upon handling.

The surface is beset with projecting fibers 2 to 3 mm high and about 3 mm apart, between which conspicuous openings show. These are probably the pores and are about one for each square mm. They are several hundred μ in diameter. The oscules are 3 mm in diameter and 1 to 3 cm apart.

The ectosome consists of a dermis 15 μ thick, consisting first of protoplasm, but containing many tangentally arranged spicules. It is set off from the endosome by extensive and conspicuous subdermal cavities. The endosome contains notable fibers in vague reticulation.

As noted above the skeleton consists of fibers which are about 500 μ in diameter, containing approximately 150 spicules per cross section. These spicules are exclusively oxeas, 2 μ by 280 μ to 10 μ by 300 μ in dimensions.

Burton, 1934, page 12, described *Hoplochalina glacialis* from the Antarctic. This has spicules very much smaller than those of any others in the genus. At present, other than this, there exist in *Hoplochalina* four additional species names, all erected by Lendenfeld for specimens from Australia. The descriptions of each one of these sounds very much like the descriptions of all the other three, and it is here suggested that they represent but a single species, which may be known as *Hoplochalina dendrilla* Lendenfeld, 1887, page 823. The species names which are dropped in synonymy to *dendrilla* are *incrustans, renieroides,* and *tenella,* all by Lendenfeld, 1887, page 823. The species *agoga* is close to *dendrilla,* but the latter has spicules which are 13 μ by 500 μ and, therefore, are much larger than those of *agoga. Dendrilla* has also a pronounced tendency to ramose form and has a less ornate surface.

The name *agoga* is an arbitrary conbination of letters, without descriptive significance.

ORDER HADROMERINA, Topsent (or HADROMERIDA*)

FAMILY CHOANITIDAE de Laubenfels
GENUS *SPIRASTRELLA* Schmidt
Spirastrella potamophera, new

Text Figure No. 134

This species is here represented by the following:

U.S.N.M. No. 22965, My No. M. 339, here designated as type, collected July 2, 1949, by diver at Majuro Atoll in the southeast corner of the lagoon near Te-elop Islet. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 22934, My No. M. 304, collected June 11, 1949, by hand while wading at Ailing-lap-lap Atoll in the south portion of the lagoon near Bikájela Islet. The depth was near low tide mark, and the substrate was dead coral.

* See footnote on page 4.

U.S.N.M. No. 22855, My No. M. 149, collected July 7, 1949, by diver at Ebon Atoll in the southeast portion of the lagoon. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 22844, My No. M. 135, collected July 5, 1949, by diver at Ebon Atoll from the Pearl Pool in the west portion of the lagoon. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 22867, My No. M. 161, collected July 11, 1949, by diver at Likiep Atoll from the east portion of the lagoon near Lado Islet. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 22881, My No. 180, collected August 1, 1949, by diver in eastern Ponapé (Matalanim) from a reef near an entrance to the lagoon. The depth was 5 meters, and the substrate was dead coral.

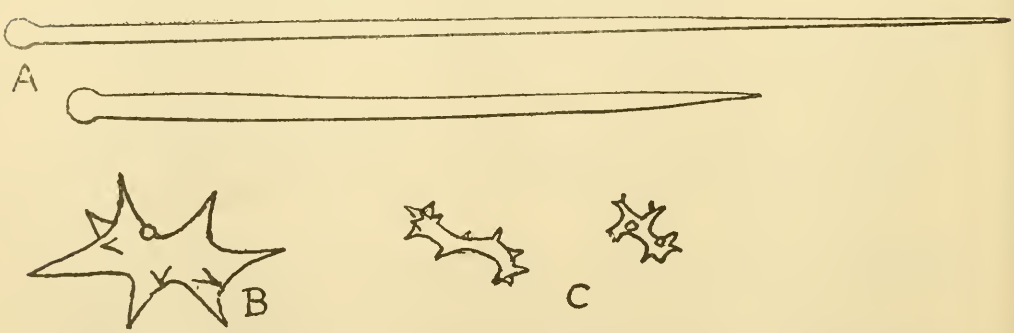
U.S.N.M. No. 22891, My No. M. 191, collected August 3, 1949, by diver in Southwest Ponapé (Kiti) near Kepara Islet from a reef in the lagoon near the open ocean. The depth was 3 meters, and the substrate was of dead coral.

This species is extremely abundant throughout the Marshall Islands and Ponapé. Unless it was buried in sand, almost any specimen of dead coral brought to the surface may be found to have either a small or a large incrustation of this *Spirastrella* on the under side.

This species is regularly incrusting, about 1 mm thick (never much less nor more than this). Lateral growth is indefinite, oftentimes 15 or 20 cm, but the majority of specimens are coin-sized.

The color in life was always red but might have slight brownish tinges, possibly due to the presence of small green plant forms. The consistency was soft, almost colloidal.

The surface is smooth and marked by conspicuous river-like patterns, which represent large subdermal canals. These begin as myriads of small canals, which flow together into fewer and larger ones and doubtlessly ter-



Text Figure No. 134. Spicules of *Spirastrella potamophera*. *A:* Two of the tylostyles, X 182. *B:* Larger size spiraster, X 782. *C:* Two spirasters of the smaller size range, X 782.

minate at oscules. These close so rapidly that by the time the sponge is brought out of water, they are quite shut. The pores can readily be made out as nearly 200 μ in diameter, about 3 per each square mm of surface.

The ectosome is characterized by the very thin translucent dermis. The endosome is rather densely packed with spicules. It seems clear that the inhalant canals or prosochetes, almost perpendicular to the surface, lead down from the optically evident pores. In contrast, the exhalant canals or apochetes appear to be represented chiefly by the river systems that are parallel to and near the surface.

The skeleton comprises large tylostyles, often about 19 μ by 500 μ to 16 μ by 700 μ in dimensions. Smaller ones are probably juvenile. There are exceedingly abundant spirasters of typical shape. The largest, particularly in the Ponapé region, may be as much as 80 μ in total length. In the Marshall Islands, a length of 50 μ is more frequently the maximum. On the other hand, the spirasters may be as short as 10 μ, and in this case are almost euasters. Intermediates between the two sizes do occur, but they are probably juvenile forms of the larger ones, so that this species may be described as having two categories of spirasters.

The type of this genus is *Spirastrella cunctatrix* Schmidt, 1868, page 17, a Mediterranean species. The present species is obviously close to *cunctatrix,* but the latter has only one size range of spiraster, considerably smaller than the largest ones of *potamophera.* It is described as having its oscules in grooves, but these do not seem to be river systems increasing in size as they decrease in numbers. Instead, they seem to be somewhat parallel rifts. Another closely related form was first described as *Thalysias coccinea* by Duchassaing and Michelotti, 1864, page 84, from the West Indies, where it is an exceedingly abundant species. It does not have the pronounced grooves or river system and in spiculation is more like *cunctatrix* than it is like *potamophera.*

The species name *potamophera,* is from a Greek work for "river" and "to bear," because this species bears river systems in its structure.

Spirastrella decumbens Ridley

Text Figure No. 135

This species is here represented by the following:

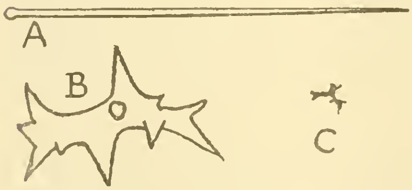
U.S.N.M. No. 22899, My No. M. 201, collected August 13, 1949, by diver in the west portion of Truk lagoon south of Pollé Islet. The depth was 4 meters, and the substrate was dead coral.

U.S.N.M. No. 22857, My No. M. 151, collected July 7, 1949, by diver at Ebon Atoll from the southeast portion of the lagoon. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 22848, My No. M. 142, collected July 5, 1949, by diver at Ebon Atoll from the miniature lagoon at the south corner of the lagoon.

The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 22935, My No. M. 305, collected June 11, 1949, by hand while wading in the south portion of the lagoon at Ailing-lap-lap Atoll. The depth was 30 mm, and the substrate was dead coral.



Text Figure No. 135. Spicules of *Spirastrella decumbens*. *A:* Tylostyle, X 182. *B:* Spiraster of the larger size range, X 782. *C:* Spiraster of the smaller size range, X 782.

This species also was collected by T. E. Bullock at Eniwetok Atoll in the summer of 1948 and is represented by his Specimen No. Z 106.

This species is incrusting, from 1 to 3 mm thick, spreading laterally indefinitely, often as much as 10 cm.

The color in life is typically brown, varying from flesh color to chocolate and occasionally to red. The consistency is spongy.

The surface is level and shows river systems to a small extent, but not as conspicuously as in the preceding species. As in *potamophera,* however, the oscules, which are closed in all collected specimens, were probably at the mouths of the river systems. The pores are about 100 μ in diameter and plentifully scattered in the regions between the evident subdermal canals.

The ectosome is represented by a very thin fleshy dermis, which, as in the preceding species, contains numerous microscleres. The endosome is represented by a rather confused structure, chiefly protoplasmic.

The skeleton consists of tylostyles with elongate heads, typically half again as long in the long axis of the spicule as the greatest diameter of the heads. These are considerably smaller than in *potamophera,* ranging up, however, to as much as 6 μ by 380 μ. The microscleres also are rather sharply divided into two categories. Those of the larger category are only 36 μ long, often less; and those of the smaller category are often only 6 μ long.

At Ebon Atoll and Ailing-lap-lap Atoll, this species occurred in the same ecological placement as the preceding one. Therefore, it does not seem likely that the differences are due to environmental circumstances. Ridley, 1884, page 470, described *Spirastrella decumbens* from the East Indies. His description omits some of the details here given, but details that are available match closely those of the species here identified as *decumbens.* As noted, this differs from *potamophera* in having smaller megascleres and smaller microscleres of both size ranges. Also, it has a greater tendency to be brownish, although the red pigment also is obviously present. It is here suggested that there are only four species in the genus *Spirastrella,* as now embodied in the literature. These are *cunctatrix, coccinea, decumbens,* and *potamophera.* All four are characterized by persistently incrusting shape. The many other

species which have been referred to this genus, having massive or ramose forms, should eventually be transferred to other genera, for example to *Anthosigmella,* but revision of the whole group of *Spirastrella* is not undertaken here.

GENUS *ANTHOSIGMELLA* Topsent
Anthosigmella vagabunda, Ridley

Text Figure No. 136
Plate IX, Figure b

This species is here represented by the following:

U.S.N.M. No. 22968, My No. M. 344, collected July 5, 1949, by hand while wading in the Pearl Pool in the western portion of the lagoon at Ebon Atoll. The depth was just below low tide, and the substrate was coral sand.

U.S.N.M. No. 23017, My No. M. 397, collected July 13, 1949, by diver at Likiep Atoll near the south side of the lagoon in the vicinity of Eotli Islet. The depth was 5 meters, and the substrate was coral sand.

U.S.N.M. No. 23038, My No. M. 417, collected July 30, 1949, by diver in northwest Ponapé in the lagoon near the shore. The depth was 2 meters, and the substrate was small fragments of dead coral.

U.S.N.M. No. 23057, My No. M. 437, collected August 1, 1949, by hand while wading in eastern Ponapé (Matalanim) near Nanmatal Island. The depth was very shallow, so that at low tide specimens often protruded from the water. The substrate was coral sand and "turtle grass."

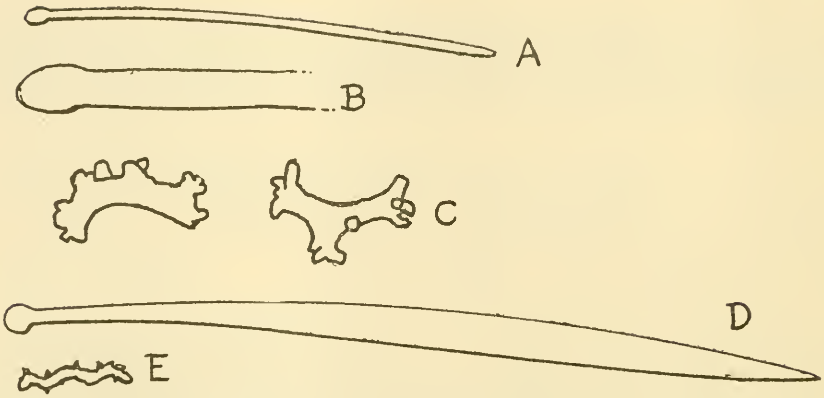
U.S.N.M. No. 23079, My No. M. 461, collected August 13, 1949, by hand while wading in the western portion of Truk lagoon south of Pollé Islet. The depth was about 30 cm, and the substrate was coral sand.

U.S.N.M. No. 23105, My No. M. 487, collected September 1, 1949, by divers in Iwayama Bay near Koror in the Palaus. The depth was 2 meters, and the substrate was small fragments of dead coral.

U.S.N.M. No. 22913, My No. M. 218, collected September 1, 1949, by diver in Iwayama Bay near Koror in the Palaus, from muddy water discolored by plant material and near mangroves. The depth was 2 meters, and the substrate was mixed mud and coral sand.

U.S.N.M. No. 22807, My No. N. 013, collected on June 5, 1946, by dredging at Eniwetok Atoll near the center of the lagoon, 8 kilometers north of the south anchorage. The depth was 35 meters. The collector was W. R. Taylor. This specimen is atypical and appears to be stunted.

This species probably has always a basal ramifying mass, which is often buried under sand or muddy sand. From this, conspicuous and numerous cylindrical or conical projections arise. These are often 2 or 3 cm in diameter and may be as much as 12 cm high. On Truk and also at Koror a few speci-



Text Figure No. 136. Spicules of *Anthosigmella vagabunda. A:* Tylostrongyle, X 182. *B:* Head of common tylostyle, X 782. *C:* Spirasters with blunt spines, X 782; while not the commonest sort, they are distinctive. *D:* Tylostyle with swollen shaft, X 182. *E:* Commonplace spiraster, X 782.

mens were found rising up as much as 25 cm. In such cases the diameter might be as great as 15 cm.

The exterior color in life varied from an ochraceous brown to walnut brown; the interior was always somewhat paler, and occasionally more yellowish. The consistency was between spongy and fragile.

The surface is smooth, undulatory, and micro-punctiform. The pores are about 40 μ to 80 μ in diameter and often only 100 μ apart. Occasionally, they are 300 μ to 400 μ apart. The oscules vary from 4 to (more commonly) 12 to 16 mm in diameter and are located conspicuously at the summits of the digitate processes or subconical cylinders described above. Not only is the location of itself conspicuous; but the lining of the cloaca of each oscule is dark, and the exterior around the oscule is consistently a pale yellow color for a distance of from 1 to 5 or 6 mm away from the rim. This brings the oscule into extremely noticeable prominence.

The ectosome is characterized by a dense spicular structure. Often the spicules (megascleres) are somewhat smaller than those of the endosome, and they usually have their points directed towards the surface. Thus, there is a suggestion of resemblance to the genus *Suberites.* The endosome is characterized by spicules which are almost always in complete confusion.

The skeleton consists chiefly of tylostyles, which may be as large as 27 μ by 600 μ, although often they are only 8 μ by 500 μ. It is noteworthy that a few of them are styles, but these are then of the same size range as the tylostyles. The microscleres are not numerous and are usually rather typical spirasters. It is quite significant that a number of them are not typical spirasters but instead are characterized by very blunt projections, rather to be called tubercles than spines. Furthermore, many of these microscleres, instead

of being spiral, have a single curve in one plane, like a letter "C." The sizes range from about 13 μ to 20 μ in chord length.

Duchassaing and Michelotti in 1864, page 86, described from the West Indies, *Thalysias varians,* which was transferred to *Anthosigmella* by de Laubenfels, 1936, page 143. (See also de Laubenfels, 1949, in regard to Bahamas sponges.) This species has tylostyles, about 6 μ by 300 μ, and microscleres 24 μ chord length. The latter are rarely typical spirasters but usually are "C"-shaped, with a single curve in but one plane and have tubercles rather than sharp-pointed spines. These tubercles may be consistently arranged along the convex side of the microsclere. The genus *Anthosigmella* was erected by Topsent, 1918, page 557, precisely for this peculiar microsclere shape. This common West Indian sponge is strikingly marked by its occurrence in coral sand with a buried substratum from which digitate processes arise. These have exactly the conspicuous oscules with pale rim and dark lining (the same consistency and structure to the most minute detail) as the species here identified as *vagabunda. Spirastrella vagabunda* was described by Ridley, 1884, page 468, from the vicinity of the Indian Ocean, and its range was extended to the Philippine Islands by Wilson, 1925, page 343. It is here transferred for the first time to *Anthosigmella,* close to *varians,* from which it seems to differ in that its microscleres are usually typical spirasters and never exactly like those of *varians,* the genotype of *Anthosigmella.* On the other hand, the resemblance in every other way is so close that it is possible that the Pacific species is even conspecific with *varians.*

FAMILY SUBERITIDAE Schmidt

GENUS *PSEUDOSUBERITES* Topsent

Pseudosuberites andrewsi Kirkpatrick

Text Figure No. 137

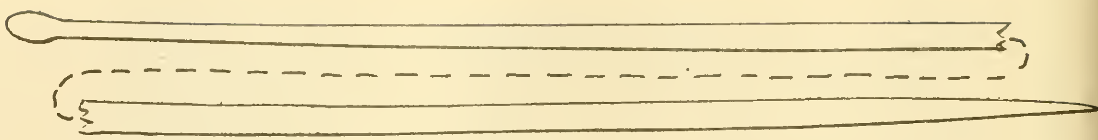
This species is here represented by the following:

U.S.N.M. No. 22838, My No. M. 123, collected June 28, 1949, by diver at Majuro Atoll at the north side of the lagoon near Enemanok Islet. The depth was 2 meters, and the substrate was the sheltered underside of an upside-down enameled dinner plate.

U.S.N.M. No. 22840, My No. M. 128, collected June 29, 1949, by diver at Majuro Atoll, in the western portion of the lagoon, near Laura Islet in the miniature lagoon there. The depth was 2 meters, and the substrate was dead coral.

This species is incrusting to massive, as found in the Marshall Islands. It reaches a vertical measurement of 8 mm, and a lateral growth of at least 3 cm.

The color in life of Specimen No. M. 123, was transparent, faintly



Text Figure No. 137. Spicule (tylostyle) of *Pseudosuberites andrewsi*, X 782.

ochraceous, while that of No. M. 128 was dark purple. This is very remarkable and almost warrants the erection of new species, but the two seem in other respects conspecific. Therefore, such action is not at present taken. This particular difference may be ecological, due to the peculiar substrate. The consistency was softly colloidal.

The surface is shiny smooth, and the location of the pores is rendered evident by minute pits. They are completely closed upon collection. The oscules cannot be discriminated from the pores.

There seem to be no special ectosomal structures, other than merely protoplasmic ones, and the endosome is similarly vague.

The skeleton consists of tylostyles in confusion. These are 4 μ by 355 μ in measurement.

Kirkpatrick in 1900, page 134, described *Pseudosuberites andrewsi* from the eastern portion of the Indian Ocean. Many species from that vicinity also are found throughout the portion of the western Pacific which is treated in the present paper. Kirkpatrick's specimen was lamellate and had spicules 6 μ thick, but in other ways the comparison is very close to No. M. 123.

GENUS *ATERGIA* Stephens

Atergia purpurea, new

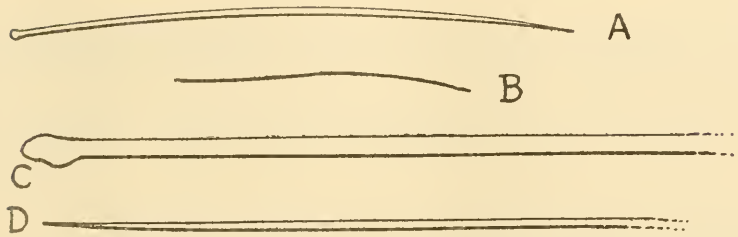
Text Figure No. 138

This species is here represented by the following:

U.S.N.M. No. 22969, My No. M. 345, here designated as type, collected July 5, 1949, by hand while wading in the Pearl Pool in the western portion of the lagoon at Ebon Atoll. The depth was just below low tide, and the substrate was algae of the *Valonia* type. This sponge was found also on algae of the coralline type. Several handfuls could be collected in this vicinity, but large specimens could not be disentangled from the ubiquitous algae.

The ectosome and endosome color in life was dull purple. It is noteworthy that when placed in alcohol, this color faded and the alcohol became orange. The consistency was mediocre.

The surface of this species is smooth and micro-punctiform, with pores 40 μ to 50 μ in diameter, and about 100 μ apart. Oscules as distinct from the inhalant apertures could not be made out.



Text Figure No. 138. Spicules of *Atergia purpurea*. *A:* Tylostyle, X 182. *B:* Raphide or oxea, X 182. *C:* Head of a tylostyle, X 782. *D:* Pointed termination of one of the oxeas, X 782.

The ectosome is not conspicuous. There is no detachable membrane but merely a somewhat denser protoplasmic structure. The endosome is exceedingly dense and amorphous. There is a very small ratio of cavities of any sort whatever.

The skeleton consists primarily of tylostyles with elongated heads. Most of these megascleres are perpendicular to the substrate, with their points towards the surface of the sponge. In fact, in some places at the surface, there occur what may be called dermal tufts. Deeper in the sponge, the spicules are mostly in confusion. These tylostyles range from about 2 μ by 220 μ to 5 μ by 410 μ in dimensions. Among them there are very numerous oxeas or raphides, 1 μ to 155 μ.

There are three other species names at present in the genus *Atergia.* Carter, 1876, page 395, described *Cometella simplex* from the north Atlantic only very briefly, so that it cannot be said to be well known. It was an egg-shaped specimen, rising on a tall stalk. Stephens, 1915, page 32, described *Atergia corticata,* the type of the genus, from Ireland. In addition to tylostyles, such as occur in *purpurea, corticata* had other very large ones, ramifying through the sponge, 18 μ by 1500 μ in measurement. The oxeote spicules were only 2 μ by 80 μ. In 1945, page 36, Dickinson described *Atergia corona* from Lower California (Mexico). The spiculation is much like that of *corticata,* but the cortical spicules are much smaller, so that a greater resemblance to *Suberites* exists.

The species name which is selected refers to the color of the species.

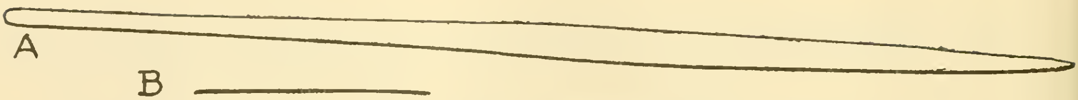
GENUS *AAPTOS* Gray

Aaptos unispiculus (Carter) de Laubenfels

Text Figure No. 139

This species is here represented by no specimens at all. It was collected in the summer of 1948 by T. E. Bullock at Eniwetok and represented by his Specimen No. Z 11.

This is a thin, incrusting sponge.



Text Figure No. 139. Spicules of *Aaptos unispiculus,* X 182. *A:* Style with swollen shaft. *B:* Very thin oxea, or raphide.

The color in life was pink, and the consistency was hard.

The surface is level and lipostomous.

The ectosome consists of a dense stand of spicules, and the endosome mostly of spicules chiefly in confusion.

The skeleton consists of styles with considerably enlarged central portion, ranging up to as much as 18 μ by 800 μ in the specimen from the Marshall Islands.

This species was first described as *Hymeraphia unispiculum* by Carter, 1880, page 467, from the Indian Ocean. It was transferred to *Aaptos* by de Laubenfels, 1936, page 152.

Aaptos chromis, new

Text Figure No. 140

This species is here represented by the following:

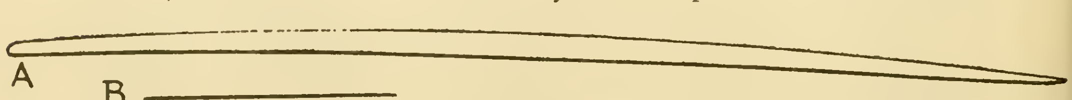
U.S.N.M. No. 23086, My No. M. 468, here designated as type, collected August 13, 1949, by diver in Lemotol Bay in the western portion of Truk lagoon. The depth was 4 meters, and the substrate was dead coral.

This species is massive, 10 cm high, and 10 by 20 cm in horizontal measurement.

The color in life was dull green to dull dark drab on the exterior but always brilliant yellow on the interior. The appearance of the outside must be considered further in connection with the discussion of the ectosome. The consistency was spongy, but the spicules could be felt sensibly by the fingertips.

The surface is densely hispid, like velvet or fine plush. In this structure, the pores, being closed, cannot be made out, but the oscules are quite noticeable, 8 mm in diameter and 3 to 6 cm apart. The oscules in this species are closed in a powerful and fairly rapid manner by muscular contraction, like sphincters.

In addition to containing many spicules erect with points toward the outside, the ectosome is covered with symmetrical patches of debris. Pores



Text Figure No. 140. Spicules of *Aaptos chromis,* X 182. *A:* Style. *B:* Raphide.

may be absent from these patches, and confined to the grooves between them. These debris-covered patches are about 1 by 2.5 mm in size, and the meandering spaces between them are uniformly about 1 mm wide. The endosome is densely micro-cavernous, or bread-like, with large spicules and short tracts showing plainly.

The skeleton consists of styles of two size ranges, the larger ones 21 μ by 770 μ and the smaller ones 2 μ by 160 μ. These, as characteristic of the genus *Aaptos,* are slender for quite a distance near the head, and are largest or swollen about one third of the way from the sharply pointed end.

Schmidt, 1864, page 33, described *Ancorina aaptos* from European waters, which was made the type of the genus *Aaptos* by Gray, 1867, page 519. Several other species from European, Mediterranean, and West Indian waters have been referred in synonymy to this species in various of the writings of Topsent. This species, *Aaptos aaptos,* has spicules far larger than those of *Aaptos chromis.* In fact, many of them are as large as 42 μ by 1800 μ. In de Laubenfels, 1935, page 8, *Aaptos vannamei* is described as from Lower California and the eastern Pacific region. This has spicules even more enormous than those of *aaptos* itself, many being as much as 120 μ by 6000 μ. Thus, the new species from the western Pacific may be characterized by the relatively small size of its spicule type. Its peculiar dermal structures are also worthy of very careful consideration.

The specific name is derived from the Greek word supposedly indicating yellow or greenish color and is based upon the bright coloration of the interior of this form.

GENUS *RIDLEIA* Dendy

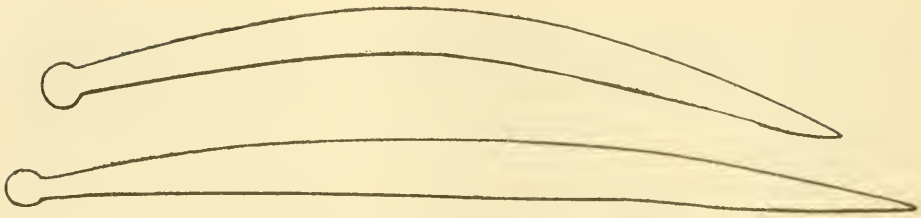
Ridleia peleia, new

Text Figure No. 141

This species is here represented by the following.

U.S.N.M. No. 23134, My No. M. 517, here designated as type, collected September 8, 1949, by hand while wading in a bay 5 kilometers north of Ngeremetengel on Babeldaub Island in the Palaus. The depth was 30 cm, and the substrate was mud.

As seen under water, the fairly numerous specimens of this sponge occurring at the point of collection appeared as mere hollow cylinders protruding out of the mud, rising a distance of 2 or 3 cm above the surface of the mud, and having a diameter of 2 or 3 cm. Their walls were from 1 to 5 mm thick, and the central hollow nearly 2 cm in diameter. It was obvious that there might be considerable quantities of the sponge buried in the mud, but further efforts of collection were baffled by a storm, accompanied by wind and violent rain, which broke at that moment.



Text Figure No. 141. Spicules (tylostyles) of *Ridleia peleia*, X 182.

The color in life was pinkish red, and the consistency was soft, easily torn.

The surface is smooth and lipostomous. The oscules, however, are probably represented by the large central hollow.

The spicules in the wall of this sponge are chiefly in confusion, but a very peculiar condition exists as to one end of each of the cylinders. Because of the confusion in the above-mentioned storm, no record is available as to which of the two ends of the specimens in the collecting jar had protruded from the mud. In each case, however, one of these two ends is relatively clean, and the other is very muddy; one, therefore, might conclude that the muddy end was the region which had been buried. Furthermore, this muddy end is adorned with conspicuous tufts, which look like rooting tufts and may be rooting tufts. On the other hand, the spicules in these tufts have their points directed away from the main mass of the sponge in a plumose fashion. This would indicate that they were at the summit, not the base. These problematical root structures are about 65 μ in diameter and 500 μ to 1000 μ long. Perhaps there was no large basal mass buried in the mud, and the entire organism may have consisted of the hollow cylinder. More information is desirable.

The skeleton consists of peculiar tylostyles; of these the central portion is much swollen, giving the fusiform shape. A maximum size of 35 μ by 670 μ is reached, but in such a spicule the neck is only 15 μ and the head 27 μ in diameter.

All the other species now in the genus *Ridleia* have smaller spicules than *peleia*. Kieschnick, 1896, page 534, described *Suberites oculatus* from the East Indies, unrecognizably. Thiele, 1900, page 175, redescribed the species from new material and de Laubenfels, 1936, page 151, referred this to *Ridleia,* with hesitation. If this generic allocation is correct, this species is not only the closest geographically but also has spicules the most nearly like those of *peleia*. However, whereas Thiele in one place refers to the spicules of his sponge as being tylostyles, in all other places he calls them styles. His figures are exclusively of styles. Therefore, it is decidedly possible that *oculatus* is not a member of the genus *Ridleia* at all. The type of the genus is *Ridleia oviformis* Dendy, 1888, page 515, and its spicules are the smallest of any in

the genus. Its location is known only as "Porcupine Station No. 82". A fourth species was described as *Ridleia dendii* by de Laubenfels, 1934, page 10, from the West Indies, which not only had spicules only 20 μ by 500 μ but was hard where *peleia* is soft, and yellow where *peleia* was pink.

The specific name here selected is derived from the Hawaiian goddess of volcanoes, Pele, because of the crater-like appearance of the specimen as viewed in the field.

GENUS *TERPIOS* Duchassaing & Michelotti

Terpios fugax Duchassaing & Michelotti

Text Figure No. 142

This species is here represented by the following:

U.S.N.M. No. 22951, My No. M. 324, collected June 24, 1949, by diver in the northwest portion of the lagoon near Jih Islet at Ailing-lap-lap Atoll. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 22888, My No. M. 188, collected August 3, 1949, by diver in southwest Ponapé (Kiti) near Toletek Islet, from a reef in the lagoon near the shore. The depth was 4 meters, and the substrate was dead coral.

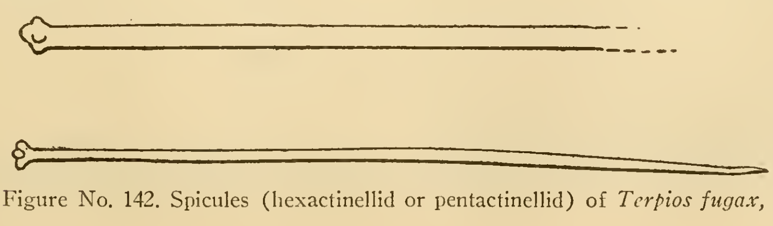
This species is a thin incrustation, less than 1 mm thick, and each patch is usually not much larger than a postage stamp. Such patches, however, are very common in many places, probably even in other islands and atolls than the two here recorded. It would have been an impossibly time-consuming task to study every one of the myriads of fingernail-sized incrusting sponges which can readily be found on the branches of dead coral.

The color in life was rich, dark blue, and the consistency was mediocre.

The surface is smooth and lipostomous.

The ectosome is not particularly developed, and the endosome is so thin that little more can be said than that the chambers exist and spicules are chiefly in confusion, but often with the points directly towards the surface.

The skeleton consists of small distinctive megascleres, ranging from 2 μ by 130 μ to 5 μ by 300 μ but very often 3 μ by 180 μ in dimensions. Some of these definitely appear to be hexactinellid or pentactin spicules. One end is pointed, but at the other end there are four blunt protrusions at right angles to each other (pentactinal). In some cases a prolongation of the shaft extends past this cross (hexactinal).



Text Figure No. 142. Spicules (hexactinellid or pentactinellid) of *Terpios fugax*, X 782.

Duchassaing and Michelotti, 1864, page 102, described *Terpios fugax* from the West Indies, and these specimens are exceedingly like those from the type locality. De Laubenfels, 1950, page 28, discusses *Terpios zeteki* as occurring in the Hawaiian Islands. Its type locality is the vicinity of the Panama Canal at the Pacific end, see de Laubenfels, 1936, page 450. This species has spicules less pronouncedly pentactin or hexactin but verging in that direction. Like all large specimens of *Terpios fugax,* it has a yellow endosome. Its ectosome, however, is usually one or the other of two colors, a bright red, or a dull bluish green, each specimen being the same color throughout as to ectosome. It is worthy of comment that adjacent to No. M. 324 there was found and collected Specimen No. M. 325, which was quite similar to it, except that its ectosome was bright red. Does this indicate a resemblance to *Terpios zetcki?* On the other hand, No. M. 325 does not have the hexactinellid spiculation, and its consistency was slimy, and it is not at present identified.

Terpios aploos, new

Text Figure No. 143

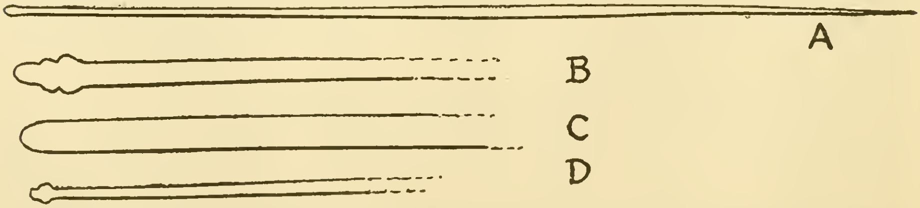
This species is here represented by the following:

U.S.N.M. No. 23141, My No. M. 525, here designated as type, collected September 20, 1949, by diver in northwest Guam on Dungas Beach, which is northeast of Agana. The depth was 1 meter, and the substrate was sand.

U.S.N.M. No. 22843, My No. M. 134, collected July 5, 1949, by diver in the Pearl Pool in the western portion of the lagoon at Ebon Atoll. The depth was 5 meters, and the substrate was coralline algae. This specimen is identified only with great hesitation.

This species is amorphous, reaching a height of 4 cm and a diameter of 12 by 18 cm.

The ectosome color in life was slaty gray, and the endosome color was ochre yellow; but throughout a zone about 14 mm thick, the slaty gray ectosome blended into the ochraceous endosome. The consistency was softly fragile.



Text Figure No. 143. Spicules of *Terpios aploos. A:* Commonplace tylostyle, X 182. *B:* Head of a style, showing multiple, obtuse branches, X 782. *C:* Head of a commonplace style, X 782. *D:* Head of a spicule which is almost a tylostyle, X 782.

The surface is extremely irregular, being covered by lumps which are in turn lumpy. The pores are 60 μ to 120 μ in diameter, and there are 2 or 3 per mm. The oscules are 2 to 4 mm, from 1 to 3 cm apart.

The ectosome is marked off as noted above, and there are extensive subdermal cavities. The endosome is extremely full of coarse sand but also has fibers or tracts 60 μ to 120 μ in diameter, making a vague reticulation. There are also some very small fibers, which may be regarded as transverse, measuring only about 10 μ in diameter and containing only 2 or 3 spicules per cross section.

The skeleton, in addition to the fibers mentioned above, consists of very numerous tylostyles, about 5 μ by 245 μ in dimensions. Renewed attention here may be called to the quantity of foreign material present in the endosome of this sponge. At the surface the megascleres are both tangent and erect. There are surface brushes present, consisting of groups of spicules with the points radiating outward.

The above description applies chiefly to the specimen from Guam. The specimen from Ebon agrees in general, but is was so small that many of the items here described could not be made out.

This species is set off from others in the genus by the large amount of foreign material, the extremely irregular surface, and the peculiar coloration. It is perhaps closest to *Terpios proteus* Hentschel, 1909, page 389, from Australia, but this has two size ranges of spicules. Also, the species *aploos* lacks the larger size range that was present in Hentschel's species. There are the above mentioned differences in surface structures, and the foreign material present.

The species name *aploos* is derived from a Greek word meaning "not seaworthy."

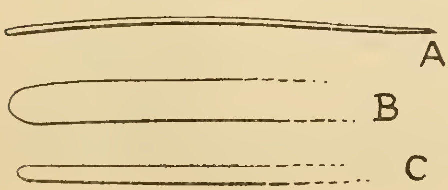
GENUS *QUASILLINA* Norman

Quasillina quiza, new

Text Figure No. 144

This species is here represented by the following:

U.S.N.M. No. 22835, My No. M. 115, here designated as type, collected June 28, 1949, by diver at Majuro Atoll near the north side of the lagoon close to an abandoned radio station. The depth was 3 meters, and the substrate dead coral.



Text Figure No. 144. Spicules of *Quasillina quiza. A:* Style, X 182. *B:* Head of one of the larger styles, X 782. *C:* Head of one of the smaller styles, X 782.

This is a thin incrusting sponge, 0.5 mm thick, covering 4 square cm.

The color in life was dark blue, and it is very noteworthy that this color has held in alcohol, bleaching only slightly. The consistency was mediocre.

The surface is relatively smooth and lipostomous.

No distinction of ectosome and endosome can be made because of the extreme thinness of the species.

The skeleton consists exclusively of styles, 3 μ by 285 μ to 8 μ by 320 μ in dimensions.

The systematic allocation of this specimen is very difficult. But for its small size and unique nature, it might be advisable to erect for it a new genus, because no genus at present established quite suits it. The spiculation is that of *Quasillina* and of a number of other genera, but *Quasillina* is a more massive sponge, often sack-shaped. The color is suggestive of *Terpios*, but the spiculation does not fit. A possibility exists that this is an abnormal specimen of *Aaptos*, but the large swollen spicules are completely lacking.

The species name selected reflects the perplexity engendered by this dubious sponge.

GENUS *STYLOTELLA* Lendenfeld

Stylotella agminata (Ridley) Lendenfeld

Text Figure No. 145

This species is here represented by the following:

U.S.N.M. No. 23030, My No. M. 409, collected July 30, 1949, by diver in northwest Ponapé in the lagoon between the reef and the shore. The depth was 1 to 2 meters, and the substrate was dead coral. This species is very common in this locality.

U.S.N.M. No. 23047, My No. M. 426, collected August 1, 1949, by diver in east Ponapé (Matalanim) from a reef in the lagoon near an entrance. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 23067, My No. M. 447, collected August 9, 1949, by diver, in Truk lagoon near Scheiben Islet, northwest of Moen Island. The depth was 2 meters, and the substrate was dead coral. This species is exceedingly abundant throughout all of the Truk region.

U.S.N.M. No. 22912, My No. M. 217, collected August 17, 1949 by diver at Kuop Atoll near the northeast corner of the lagoon in the lee of Givry Islet. The depth was 1 meter, and the substrate was dead coral. Several other specimens were observed in this little atoll.

U.S.N.M. No. 22919, My No. M. 225, collected September 1, 1949, by divers in Iwayama Bay, near Koror in the Palaus. The depth was 2 meters, and substrate was dead coral. This species is exceedingly abundant throughout the Palau region. In fact, it is far and away the most abundant of all sponges throughout the Caroline Islands.

U.S.N.M. No. 23140, My No. M. 524, collected September 16, 1949, by diver in Tanapag Harbor, in northwest Saipan. The depth was 2 meters, and the substrate was dead coral. This was not only the commonest, but it was the only sponge in this portion of Saipan and was one of three species occurring in this whole island.

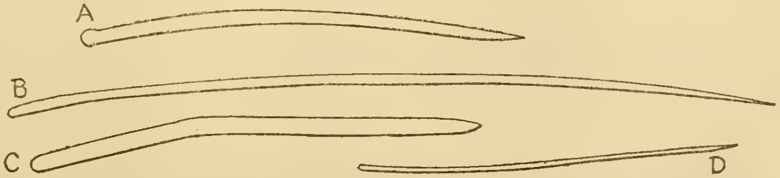
U.S.N.M. No. 23147, My No. M. 531, collected September 20, 1949, at the extreme south tip of Guam from the lagoon inside Cocos Island, known as Merizo Bay. The depth was 2 meters, and the substrate was dead coral. This species was much more common there than other sponges.

The shape of this species is typically an erect wall or sheet. Many specimens are deformed and have come to be regarded as massive; but if the environment is at all favorable, the typical shape is assumed. The size is often quite large, specimens up to 25 cm in height being found. The lateral dimensions are usually a little less than this. The thickness of the sheet is often about 3 to 6 cm.

The color in life was bright golden orange, extremely conspicuous. The consistency was mediocre.

The surface is uneven, often covered with minute tubercles about 1 mm high and 1 mm apart. The pores are about 50 μ to 140 μ in diameter and sometimes are so close together that they are only 120 μ apart. More often, however, they are several hundred μ apart. The oscules are very few in number. The smaller specimens have none, but the larger specimens have three or four apiece. These will be from 7 to 10 mm in diameter when fully opened.

The ectosome consists of a conspicuous dermis or cortex, very fine grained and sometimes rather easily separable from the underlying endosome. The thickness ranges from 50 μ to 1 mm. The nature of the endosome varies some with the size and age of the specimen. The smaller, younger ones show very little fibrous development; but as they attain to greater heights, a larger and larger percentage of the endosome is given over to fiber. In some of the largest specimens these fibers reach a diameter of more than 1 mm. They are somewhat dendritic in pattern, branching more often than anastomosing. The meshes in places are quite small, even as little as 100 μ to 200 μ in diameter;



Text Figure No. 145. Spicules of *Stylotella agminata,* X 182. *A:* Tylostyle. *B:* Long, thin style. *C:* Short, thick style. *D:* Probably a juvenile spicule.

but the larger fibers are often more than 2 mm apart. These tracts might contain some spongin but largely are densely packed with spicules, which are in somewhat plumose arrangement. Some of them seem actually to echinate the fibers. Nearly all the spicules have their points arranged towards the surface of the sponge.

The skeleton has already been described partially in connection with remarks about the endosome. In addition to the tracts, however, mention should be made of the spiculation. This consists of monaxon megascleres exclusively. These vary in a curious way from styles to subtylostyles. Apparently there is no significance whatever to which occurs in whatever location. Some specimens seem to have only the subtylostyles, some specimens have all or nearly all styles, and in other cases there is an intermingling of the two types. None are ever typically or pronouncedly tylostylote. Maximum sizes per specimen range from 13 μ by 490 μ to 9 μ by 820 μ. All sizes below this may be found, evidently due to growth stages.

This species was first described as *Hymeniacidon agminata* by Ridley, 1884, page 466, from Australia, and designated as type of *Stylotella* by Hallman, 1914, page 349. Hallman also quite properly referred other species in synonymy to *agminata,* so that this sponge has a very considerable published range throughout the Australian region. It is here considered probable that all species hitherto referred to the genus *Stylotella* are either synonyms of *agminata* or incorrectly located and worthy of transferral to various other genera. A complete revision is not, however, undertaken at the present time.

GENUS *CRYPTAX*, new

This genus is here established as in the family Suberitidae only with very considerable doubt, because there are many indications that it should belong instead in the family Clionidae. Inasmuch as that is the ensuing family, the present location between the two is as nearly appropriate as possible at the moment. The type of this genus is here established as the following species *Cryptax orygmi.* This is a genus of sponges occurring completely buried in excavations within calcareous material, but it is not at the present time at all certain that the excavations were made by the sponge which now inhabits them. Instead it may merely be moving into quarters which had been prepared by other organisms. The spiculation is also noteworthy, consisting exclusively of tylostrongyles.

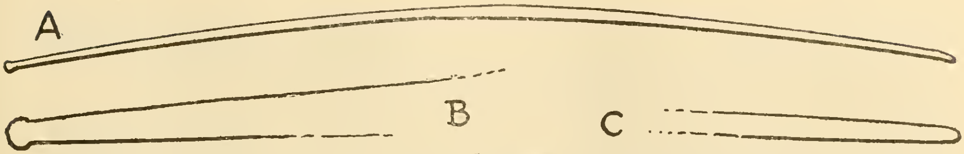
The genus name suggests the buried habitat.

Cryptax orygmi, new

Text Figure No. 146

This species is here represented by the following:

U.S.N.M. No. 22966, My No. M. 340, here designated as type, collected



Text Figure No. 146. Spicule of *Cryptax orygmi*. *A:* Tylostrongyle, X 182. *B:* Head of one of the tylostrongyles, X 782. *C:* Point of one of the tylostrongyles, X 782.

July 2, 1949, at Majuro Atoll from the southeast portion of the lagoon near Te-elop Island. The depth was 2 meters, and the substrate was dead coral.

This sponge occurred completely buried in various bits of coral in the vicinity in caverns often about 4 mm in diameter, but varying from there on down to microscopic size. Most of the surface overlying this sponge was covered by continuous layers of *Spirastrella,* as represented by Specimen No. M. 339.

The color in life was yellow, slightly ochraceous, and the consistency was soft.

The surface, pores and oscules cannot be discerned, because of the peculiar buried location of this sponge.

The ectosome and endosome also, for the same reason, are not readily distinguishable. The spicules seem to be arranged chiefly in confusion within the narrow confines of the flesh.

The skeleton consists of tylostrongyles, larger in the middle than the diameter of the tylote swelling which occurs at one end. Typical sizes of these may be given as 2 μ by 600 μ, 7 μ by 700 μ, 12 μ by 700 μ.

The specific characteristics are embodied in the foregoing discussion of the new genus.

The species name here selected is derived from a Greek word meaning "of the excavation."

FAMILY CLIONIDAE Gray
GENUS *CLIONA,* Grant
Cliona lobata, Hancock

Text Figure No. 147

This species is here represented by the following:

U.S.N.M. No. 23075, My No. M. 455, collected August 10, 1949, by a diver at the west side of Moen Islet in Truk Lagoon from a substrate of dead coral, 2 meters deep.

U.S.N.M. No. 23004, My No. M. 383, collected July 11, 1949, by diver near the southeast corner of the lagoon of Likiep Atoll, near the church. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 22978, My No. M. 354, collected July 5, 1949, by diver from the Pearl Pool in the western portion of the lagoon of Ebon Atoll. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 22998, My No. M. 376, collected July 7, 1949, by diver from the ocean at the west side of Ebon Atoll, near Rubé point, at a depth of 4 meters. The substrate was dead coral.

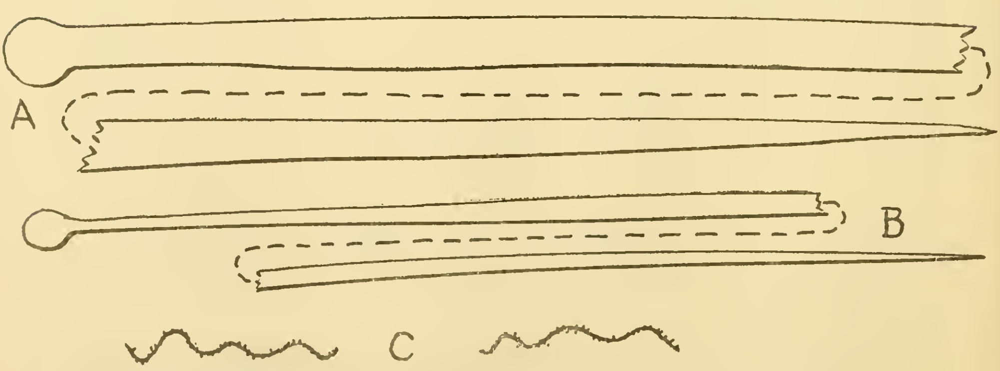
U.S.N.M. No. 22818, My No. N. 025, collected August 21, 1947, by F. M. Bayer and F. C. Zimmerman, from the reef of Rongerik Atoll near Latobak Islet in coral of the species *Stylophora mordax*. At the same time they collected two other very similar specimens—my numbers N. 021 and N. 028. All three are in U.S.N.M. Accession No. 176603.

Members of the family Clionidae bore into any submerged calcium carbonate. On the Pacific Islands, it is usually dead coral that is inhabited. To find *Cliona* one must, as a rule, break the coral into small pieces or dissolve it with acid. Therefore, it is very difficult to observe the actual abundance of boring sponges, but my field work left me with the strong impression that Clionidae were comparatively rare in the Western Pacific. Certainly, there was not the conspicuous abundance of them which is obvious in many portions of the West Indies and of the Atlantic Coast of North America.

The *Clionas* which here are identified as *lobata* were often found to have communication with the outer world by means of openings at the surface of the branches of coral, which openings were about 1 mm in diameter and 1 cm apart. The specimens from Ebon Atoll were all restricted to small but exceedingly abundant galleries in the coral. All the other specimens here included showed exceptionally large single masses in the center of the branches of coral—masses of sponge tissue 4 to 6 mm in diameter, and indefinitely long.

The color in life was bright yellow, and the consistency was soft.

The surface and the pores and oscules are obscured by the boring habitus.



Text Figure No. 147. Spicules of *Cliona lobata*, X 782. *A* and *B*: Tylostyles; in each case the entire spicule shows, but in two parts. *C*: Two of the spirasters.

The ectosome and endosome are not distinct, and the structures are chiefly in confused arrangement.

The skeleton consists of tylostyles with extremely well developed heads. The necks are often so small that the heads become broken off when the spicules are being prepared for microscopic observation. The larger spicules are often about 12 μ by 240 μ, with heads 15 μ in diameter. Smaller (perhaps juvenile) spicules are often 5 μ by 220 μ, with heads 8 μ in diameter and necks only 2 μ in diameter. These heads were found to be covered with small (one μ) tubercles in many of the megascleres of the specimens from Truk and from Rongerik. The microscleres are thin, undulatory spirasters, 27 μ to 40 μ long, often with 4 waves or spirals. The shaft is about 0.3 μ in diameter and is covered with very fine, very sharp spines. No microscleres were found in specimens M. 376, N. 021, and N. 028. In all species of *Cliona* it often happens that microscleres are absent from some portions of the sponge while present in others.

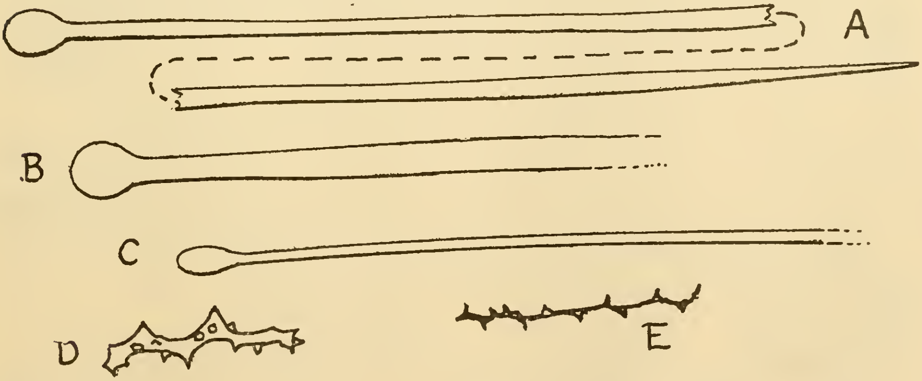
Cliona lobata was first described by Hancock in 1849, page 341, from the North Atlantic region. It appears to be moderately common on both sides of that ocean. Burton, 1935, page 78, records it from Japan. Doubtless careful search would reveal its even more widespread occurrence.

Cliona schmidtii (Ridley) Topsent

Text Figure No. 148

This species is here represented by the following:

U.S.N.M. No. 23117, My No. M. 499, collected September 2, 1949, by divers northwest of Koror in Komebail Lagoon of the Palaus. The depth was 5 meters, and the substrate was dead coral.



Text Figure No. 148. Spicules of *Cliona schmidtii*, X 782. *A:* Medium-sized tylostyle; the entire spicule shows, but in two parts. *B:* Head of one of the larger tylostyles. *C:* Head of one of the smaller tylostyles. *D:* Thicker type of spiraster. *E:* Thinner type of spiraster.

The difficulty of ascertaining relative or actual abundance of species of *Cliona* has already been discussed. It was at least moderately common in the Palaus.

The *Clionas* of the Palaus, here regarded as species *schmidtii,* are usually brown, even in life. Typical *schmidtii* is described as being carmine red to purple.

The skeleton of these boring sponges from the Palaus consists principally of tylostyles, 2 μ by 240 μ to 5 μ by 280 μ and often about 3 μ by 260 μ. The microscleres are spirasters 35 μ to 42 μ long. Some of the shorter ones are fairly thick and have a slightly spiral shaft. This is not typical of *schmidtii.* Others are very characteristic of this species as originally described; a nearly straight shaft, on which the spines are arranged in a spiral.

The species *schmidtii* was first described by Ridley, 1881, page 130, as *Vioa schmidtii* and transferred to *Cliona* by Topsent, 1900, page 77. It has been hitherto reported from the Mediterranean, Indian Ocean, and Australian regions.

Cliona euryphylla Topsent

Text Figure No. 149

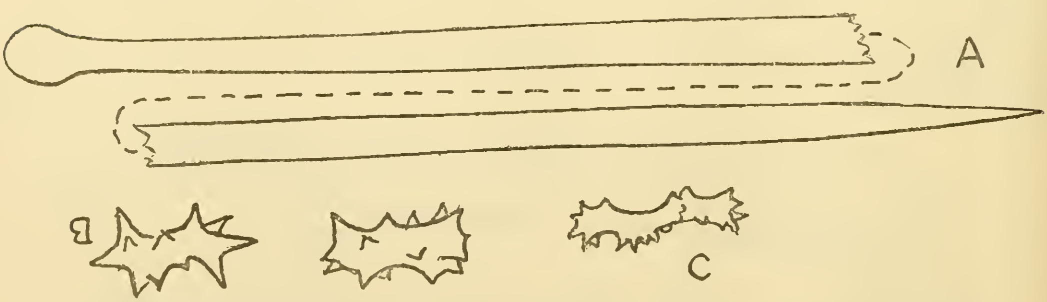
This species is here represented by the following:

U.S.N.M. No. 23036, My No. M. 415, collected July 30, 1949, by diver in northwest Ponapé from the lagoon near the shore. The depth was 5 meters, and the substrate was dead coral.

There were often as many as three galleries in one strand of dead coral 2 cm in diameter, the *Cliona* being about 2 mm in diameter.

The color in life was dull orange. The consistency was soft.

The skeleton consists primarily of tylostyles about 7 μ by 300 μ in diameter. The microscleres are very thick spirasters. The central shaft has a diameter of 4 μ to 8 μ and is only slightly undulatory or spiral. The spines



Text Figure No. 149. Spicules of *Cliona euryphylla,* X 782. *A:* Tylostyle; the entire spicule shows, but in two parts. *B:* First type of spiraster. *C:* Second, less typical, sort of spiraster.

on it are relatively few in number and large in size, as compared to those on the microscleres of other species of *Cliona.*

This species was first described as *Cliona euryphylle* by Topsent, 1888, page 82, from the eastern Pacific. Three other species of *Cliona* have been described as having the short thick spirasters with relatively few and large spines. It is here considered probable that they are all four conspecific, to be known as *euryphylla.* These include *Cliona chilensis* Thiele, 1905, page 409, from Chile, and recorded from the south Atlantic (Argentina) by Burton, 1940, page 118; *Cliona burtoni* Topsent, 1932, page 577, from the tropical Atlantic; and *Cliona aethiopicus* Burton, 1932, page 340, also from the tropical Atlantic.

Cliona vastifica Hancock

Text Figure No. 150

This species is here represented by the following:

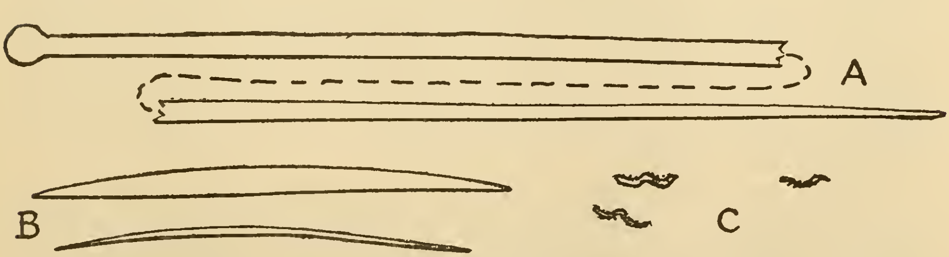
U.S.N.M. No. 22963, My No. M. 337, collected June 29, 1949, by diver at Majuro Atoll from the western portion of the lagoon near Laura Islet (in the miniature lagoon which occurs there). The depth was 2 meters, and the substrate was dead coral. This species was moderately abundant in Majuro Atoll; a high percentage of all the dead coral was found to be permeated with it.

The burrows or galleries of this species are from 1 to 3 mm in diameter and sometimes rather vague in outline.

The color in life was brick red, and the consistency slimy colloidal.

The skeleton consists first of long, straight tylostyles, 4 μ by 267 μ, and further of oxeas, 1.5 μ by 75 μ to 4 μ by 84 μ. These are almost or quite smooth, whereas in typical *vastifica* they are microspined. The microscleres proper are small spirasters, 9 μ to 14 μ long, almost straight but in some cases with three or four spiral bends. These smaller spicules are microspined quite definitely.

Cliona vastifica was first described by Hancock, 1849, page 342, from European waters, but it has since been found in practically all of the oceanic waters of the world.



Text Figure No. 150. Spicules of *Cliona vastifica,* X 782. *A:* Tylostyle; the entire spicule shows, but in two parts. *B:* Two of the oxeas. *C:* Three of the spirasters.

GENUS *AKA* de Laubenfels

Aka trachys, new

Text Figure No. 151

This species is here represented by the following:

U.S.N.M. No. 23146, My No. M. 530, here designated as type, collected September 20, 1949, by diver at the extreme south tip of Guam from the Cocos Islet lagoon, sometimes called Merizo Bay. The depth was 2 meters, and the substrate was dead coral.

Text Figure No. 151. Spicule (acanthoxea) of *Aka trachys,* X 782.

The size of the tunnels of this species are less than 1 mm in diameter, and the indications are that it is not very common through the Marianas. It may or may not be the only boring sponge present there.

The color in life was yellow, and the consistency was mediocre.

The spicules consist only of acanthostyles 4 μ by 70 μ in dimensions.

This species is unique within the genus *Aka* for the extreme spininess or roughness of its spicules.

The species name selected is derived from a Greek word meaning "rough."

FAMILY PLACOSPONGIIDAE Gray

GENUS *PLACOSPONGIA* Gray

Placospongia melobesioides Gray

Text Figure No. 152

This species is here represented by the following:

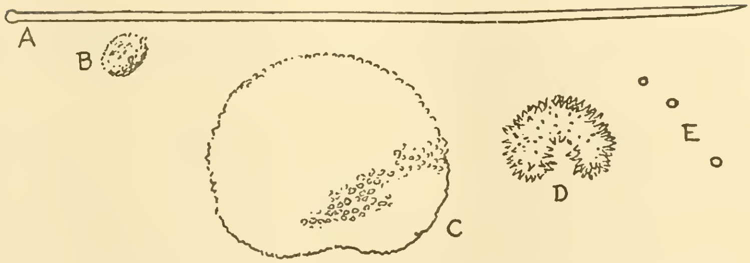
U.S.N.M. No. 23040, My No. M. 419, collected July 30, 1949, by diver in northwest Ponapé in the lagoon near the shore. The depth was 3 meters, and the substrate was dead coral.

This is a cylindrical sponge, 2 cm in diameter and 12 cm high.

The ectosome and endosome color in life was dark brown, and the consistency was that of a stony hard cortex over a mediocre interior.

The surface is relatively smooth, but covered with flat polygonal plates about 12 by 20 mm in dimensions. The ramifying cracks between them are about 1 mm wide, and they contain the pores and oscules. The exhalant and inhalant openings cannot readily be distinguished from one another and are microscopic and contractile.

The ectosome consists of a dense, stony amalgamation of microscleres, connected firmly to each other by fibrous or protoplasmic structures. The endosome is microcavernous, with spicules and other structure chiefly in confusion.



Text Figure No. 152. Spicules of *Placospongia melobesioides*. *A:* Tylostyle, X 182. *B:* Selenaster, X 182. *C:* Selenaster, X 782; only some of the rays are drawn—they practically cover the surface. *D:* Immature selenaster, X 782. *E:* Siliceous spheres, X 782.

The skeleton comprises megascleres which are tylostyles 10 μ by 800 μ in dimensions, and exceedingly numerous microscleres which occur chiefly in the ectosome. These have been called selenasters but are very much like sterrasters, except that they are flattened rather than globular. These spicules are about 60 μ long and wide but are only some 20 μ thick. They are densely covered with spiny tubercles, almost like little stars. The shape is not evenly rounded, but there is at one point an indentation or hilum, so that the shape is rather like that of a bean.

The immature selenasters are essentially spirasters. Many descriptions of species of *Placospongia* list spirasters as part of the spiculation, but it may be that the microscleres thus designated were merely juvenile selenasters.

The species *melobesioides* has as one distinctive trait, the occurrence of microscopic siliceous spheres. These may represent the centrums of spherasters from which all the spines or rays are missing. In the specimens from Ponapé, these microscleres are only 2 μ in diameter.

This species was first described by Gray, 1867, page 127, from the East Indian region. Schmidt, 1870, page 72, extended its known range to Florida, and de Laubenfels, 1936, page 154, confirmed this. Thiele found it in 1898 in Celebes of the East Indies. It may be circumequatorial.

ORDER EPIPOLASIDA Sollas

FAMILY JASPIDAE de Laubenfels

GENUS *STELLETTINOPSIS* Carter

Stellettinopsis isis, new

Text Figure No. 153
Plate X, Figure a

This species is here represented by the following:

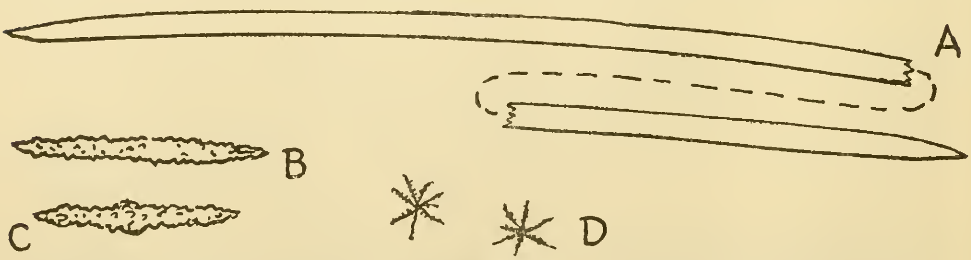
U.S.N.M. No. 23137, My No. M. 520, here designated as type, collected September 9, 1949, by divers near Malakal Islet in the Palaus. The depth was 3 meters, and the substrate was fragments of dead coral.

U.S.N.M. No. 23085, My No. M. 467, collected August 13, 1949, by diver in Lemotol Bay in the western portion of Truk Lagoon. The depth was 4 meters, and the substrate was coral sand.

It was amazing to note the lack of small specimens of this sponge. It seemed to be characterized only by enormous individuals. The type specimen was 33 cm high and 21 cm in diameter. Much larger ones were noticed in the Truk region. They extended to a height of at least 45 cm and a diameter of at least 57 cm, by actual measurement in the field. No specimens as small as a human head were observed. The shape of the bulk of the body is more or less spherical. A few specimens are wider than high, but more specimens are higher than wide. In this, an enormous cloaca with its opening in the center of the top of the sponge is conspicuous. This cloaca is often 4 cm in diameter and 8 or 9 cm deep but much larger cloacas occur. Each has a conspicuous, sharply delineated lining. On the lower side of the sponge, a number of roots are in evidence. These are often 2 or even 3 cm in diameter and 10 to 15 cm long. At the distal end, each branches into a number of short small subdivisions. These roots ramify among the fragments of coral or the coral sand in which the sponge grows and serve to give it ample support. There are usually more than five, and sometimes as many as fifteen such roots per specimen.

The color in life was in general an ochraceous brown, but the base and part of the roots are more or less maroon. Some parts of the roots are rather white, perhaps being moribund. The conspicuous cloacal lining is very dark ochre in contrast to the somewhat lighter general surface. The interior is very pale drab, but there is a subdermal layer of mahogany brown, about 1 mm below the actual surface and about 0.3 mm thick. This constitutes a sharp separation between the ectosome and the endosome. The consistency could be described as somewhat cork-like or wood-like. There was some elasticity, but a good deal of stiffness.

The surface is covered with low tubercles or knots about 1 cm high and about 4 mm in diameter. These are from 1 cm to (less often) 2 cm apart. In the valleys between them there are numerous conspicuous pores, 2 to 3 mm



Text Figure No. 153. Spicules of *Stellettinopsis isis*. *A:* Oxea, X 182; the entire spicule shows, but in two parts. *B:* Acanthoxea, X 782. *C:* Centrotylote acanthoxea, X 782. *D:* Two of the microspined oxyeuasters, X 782.

in diameter and 2 to 5 mm apart. The oscules may be said to be represented by the openings into the large cloaca. They are extremely contractile. In life they were in the neighborhood of 5 to 8 mm in diameter, very irregularly distributed. In some areas they almost touch each other while in other areas (several cm in diameter) there may be none. The size which is mentioned must be regarded with caution, because of the extreme contractility of these exhalant openings. The cloaca may reach a diameter of 10 mm.

The ectosome consists of a stiff cortex about 2 mm thick, crowded with microscleres and quite a few megascleres. There is also a cortex of especial thickness which lines the cloaca, but it is less than half as thick as the cortex which covers the exterior of the sponge. The roots are chiefly of the type of structure which is represented by the cortex. The endosome of this sponge is given over to enormous canals, 10 to 15 mm in diameter (often nearer the larger diameter). These may be said to arise at full maximum size immediately below the cortex, and they become somewhat smaller, occasionally branching, as they penetrate more deeply into the body of the sponge. They end blindly. From them, enormous numbers of pore-like apertures emerge. These are about 200 μ in diameter, and there are about 2 per square mm of the canal lining. These pore-like openings lead to the relatively thin layers of protoplasmic structure. The latter, often less than 1 mm thick, contain some tracts, about 1 mm in diameter and crowded with spicules. The canals which lead from the chamber region to the cloaca are difficult to measure because in all collected specimens they are small, but they show evidence of having been contracted by muscular effort. It is estimated that in life they must have had a maximum diameter of at least 10 mm.

The skeleton comprises enormous smooth oxeas, reaching a maximum size of at least 44 μ by 1230 μ. Sizes of about 20 μ by 1000 μ are also common. There are also smaller oxeas, perhaps to be regarded as microscleres, ranging from 3 μ by 18 μ to (more often) 3 μ by 60 μ and (occasionally) 4 μ by 45 μ in dimensions. These are covered profusely by very small spines or tubercles and often are centrotylote. These are abundantly distributed throughout the whole sponge, but are somewhat more abundant in the cortex. There also are euasters present, especially in the cortex, which are almost completely absent from the lower portions of the sponge. These have a maximum diameter of about 12 μ, and each of the 10 to 15 rays is noticeably microspined.

The genus *Stellettinopsis* was founded by Carter, 1879, page 348, for two species from south Australia. These actually appear to be conspecific, and both should be known as *corticata.* The second, described on page 349, was named *simplex.* Neither is well described. *Corticata* seems to have had spiculation much like that of *isis,* but *simplex* had a remarkable annulate distribution of the spines on the acanthoxeas or acanthostrongyles. Neither had the remarkable shape which characterizes *isis* but were smooth lobate masses

with oscules strewn over the exterior surface. *S. ketostea* de Laubenfels 1950 from Bermuda contains large oxea, small euasters, and (notably) contains streptasters. It was incrusting.

The species *Stellettinopsis isis* may be compared to *Melophlus sarasinorum* Thiele, 1899, page 8. This sponge from the East Indies is described briefly. It has spicules a good deal like those of *isis*. It was a small lumpy sponge. It is conceivable that a juvenile *isis* might be like this, but most of the characteristics upon which the species *isis* is based are not mentioned by Thiele. The genus *Melophlus* should be dropped in synonymy to the genus *Stellettinopsis*.

Brøndsted, 1934, page 8, records a sponge from the East Indies as *Jaspis bandae,* new species. His description shows plainly that it is not a *Jaspis* but is a *Stellettinopsis,* and it should now be transferred to that genus. It shows some relationship to the species *isis,* but was stony hard where *isis* is woody, and it had no cloaca, where the cloaca of *isis* is conspicuous and peculiarly set off. The asters of *bandae* were tylasters, where those of *isis* are oxyasters. Brøndsted regarded the numerous 1 to 2 mm diameter openings as oscules, whereas they are the pores. He thought that he found microscopic pores in the solid cortical structures between the openings. Some of the surface openings of his specimens doubtless really were oscules, however, because if there be inhaling, there must also be exhaling. The species *bandae* probably (but not yet certainly) should be dropped in synonymy to *sarasinorum.*

The name selected for this species is that of an Ancient Egyptian goddess. It is not descriptive but has been selected because of the imposing appearance of the sponge.

GENUS *JASPIS* Gray

Jaspis tuberculata (Carter) de Laubenfels

Text Figure No. 154

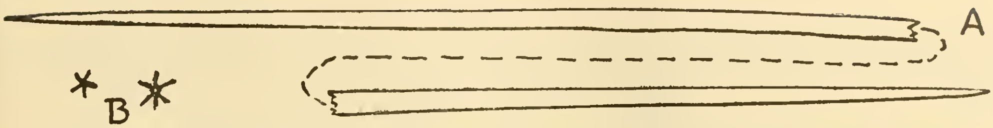
This species is here represented by the following:

U.S.N.M. No. 23003, My No. M. 382, collected July 11, 1949, by diver (Jenira) at Likiep Atoll in the southeast corner of the lagoon near the church. The depth was 3 meters, and the substrate was dead coral. Several specimens of this species occurred in this vicinity.

This species is also represented by a specimen collected at Bikini Atoll, in the summer of 1948, by T. E. Bullock, his number C-72.

This species is incrusting to massive, reaching a thickness of 2 or more cm and a diameter of at least 6 cm.

The exterior color in life was dark slaty gray, with a paler interior. The specimen from Likiep had a yellowish drab endosome. Dr. Bullock describes



Text Figure No. 154. Spicules of *Jaspis tuberculata*. *A:* Oxea, X 182; the entire spicule shows, but in two parts. *B:* Euasters, X 782.

his specimen as having a dull pink interior. The consistency is mediocre, but gritty, because the spicules are evident to the fingertips.

The surface is irregularly tuberculate, with lumps of all sizes. The pores are about 30 μ in diameter and 40 μ to 50 μ apart but irregularly distributed, so that in some large areas none can be found. The oscules are not to be discriminated from the inhalant apertures.

The ectosome is crowded with spicules arranged horizontally, while in contrast the endosome has spicules in considerable confusion.

The skeleton comprises oxeas of great variation in size but often reaching a maximum of 13 μ by 1155 μ or 18 μ by 900 μ. Some are at least as thick as 33 μ, but the larger ones seem always to have been broken before collecting so that maximum length cannot be given. The microscleres comprise very small euasters, only 4 μ or 5 μ in total diameter.

This species was first described as *Stellettinopsis tuberculata* by Carter, 1886, page 126, from South Australia. Sollas, 1888, page 207, transferred this to *Coppatias;* but de Laubenfels, 1936, page 151, shows that *Coppatias* falls in synonymy to *Jaspis*. Thus, this species may be said to have been transferred to *Jaspis* in 1936.

Jaspis stellifera (Carter) de Laubenfels

Text Figure No. 155

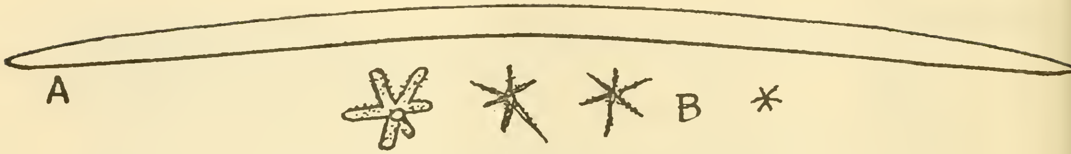
This species is here represented by the following:

U.S.N.M. No. 22897, My No. M. 199, collected August 10, 1949, by diver in Truk Lagoon just west of Moen Islet. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 22900, My No. M. 203, collected August 13, 1949, by diver in the western portion of Truk Lagoon just south of Pollé Islet. The depth was 4 meters, and the substrate was dead coral.

This species is also represented by a specimen collected in the summer of 1948, by T. E. Bullock, in Eniwetok Atoll of the Marshall Islands. This is his number Z-147.

This species, which is moderately common in the Truk region, has an extremely irregular diameter. It appears that the tendency is to assume a hollow cylindrical or tubular shape, but, because it may be growing under dead coral, the environment often interferes. The central hollow is in the



Text Figure No. 155. Spicules of *Jaspis stellifera*. *A:* Oxea, X 182. *B:* Several varieties of euaster, X 782.

neighborhood of 2 cm in diameter, and the walls 6 mm thick; but lengths of as little as 4 cm are the rule. No. M. 199 seems to have been a rather simple tube, but No. M. 203 seems to have consisted originally of a number of tubes, so crowded that they interfere with each other's symmetry.

The color in life was pale gray, almost white, especially as to endosome. The slightly darker ectosome may have been due to foreign material accumulated there. The consistency was cartilaginous and dense.

The surface is smooth or microhispid, somewhat velvet-like. The pores are not to be distinguished from the oscules, although the latter may be represented by the opening towards the interior, or cloaca. The openings on both exterior and interior are about 70 μ to 90 μ in diameter and 100 μ to 200 μ apart.

The ectosome comprises a dense layer of spicules, arranged tangentally, but otherwise in confusion. The endosome is microcavernous with numerous spicules in confusion. Other than that, they tend to outline the spaces.

The megascleres are oxeas, 15 μ by 600 μ to 25 μ by 800 μ in dimensions. Some very much thinner ones, as little as 1 μ by 105 μ, may be juvenile or developmental forms. The Eniwetok specimen shows megascleres reaching a maximum of 50 μ by 1650 μ. The microscleres are euasters of the type known as chiaster, because they have blunt terminations to the rays. Their total diameters vary from 6 μ to 15 μ, and the thickness of the rays also varies greatly, from much less than 1 μ to at least as much as 2 μ. These rays are in turn microspined, although in many cases it requires oil immersion to make out the spination.

This species was first described as *Amorphina stellifera* by Carter, 1879, page 344, from Australia. The history of its transfer to the genus *Jaspis* is like that of the transfer of the preceding species, or *tuberculata*.

GENUS *DORYPLERES* Sollas

Dorypleres splendens, new

Text Figure No. 156
Plate X, Figure b

This species is here represented by the following:

U.S.N.M. No. 23037, My No. M. 416, here designated as type, collected July 30, 1949, by diver in the northwest portion of Ponapé, from the

lagoon near the shore. The depth was 3 meters, and the substrate was dead coral. This species was common throughout Ponapé, especially southwest Ponapé in the province of Kiti.

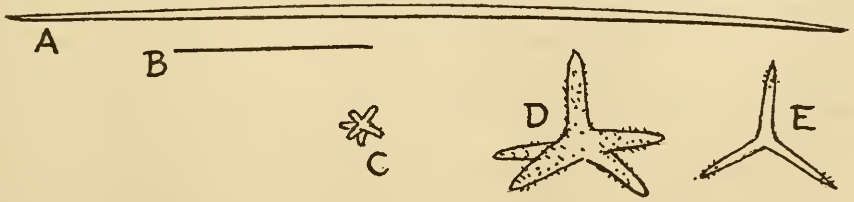
The shape of this sponge is basically massive, with digits rising up to as much as 8 cm high. The basal mass is often as much as 13 cm and the digits 2 to 3 cm in diameter.

The color in life was bright fiery orange, and this color has been maintained moderately well in alcohol. The endosome had the same color as the ectosome. The consistency was spongy, but easily torn.

The surface is between tuberculate and conulose, with one eminence for each square mm. These tubercles are about 500 μ high. The pores are about 40 μ to 60 μ in diameter and about 80 μ apart. The oscules are very muscular and close at the time of collection, but there is evidence of a diameter of about 7 mm in life. There is one oscule at the summit of each of the digitate projections.

The ectosome comprises a definite dermis, 30 μ thick. The endosome contains tracts, 100 μ to 200 μ in diameter, ascending almost perpendicularly to the surface. These are essentially protoplasmic and also contain numerous spicules but apparently not any spongin. These tracts are about 400 μ apart and in many cases (but not always) are the cause of the surface conules or tubercles as already discussed. There are vague connective fibers or tracts, which are about 20 μ to 60 μ in diameter.

The skeleton comprises oxeas which are usually about 4 μ by 150 μ but in some cases up to as much as 10 μ by 610 μ. There are also immense numbers of astose spicules. There are small asters 7 μ to 8 μ in diameter, which are chiasters or tylasters with microspined rays. Then there are oxyeuasters with fewer rays (often only five) but these rays are microspined and the total diameter of this aster is about 15 μ. Finally, there are immense numbers of oxyeuasters which have only the tips of their rays microspined. These latter asters have a total diameter of about 18 μ, and have a greatly varying number of rays. Some are only triaxons, others tetraxons; but some had as many as eight or even nine rays.



Text Figure No. 156. Spicules of *Dorypleres splendens*. *A:* Larger oxea, X 182. *B:* Smaller oxea, X 182. *C:* Chiaster, X 782. *D:* Microspined euaster, X 782. *E:* Triact, X 782.

The genus *Dorypleres* was established by Sollas, 1888, page 426, but reduced in synonymy to *Jaspis* by Topsent, 1904, page 131. It is here restored for those species which have two or more distinct categories of asters, whereas *Jaspis* has just one category of aster. *Dorypleres* still differs from *Rhabdastrella* of Thiele, 1903, page 934, in which some of the asters are spherasters. *Dorypleres* includes the type, *dendyi* Sollas, also *biangulata* Lindgren, *investigatrix* Annandale, *novaezealandiae* Dendy, and *serpentina* Wilson. From all these species, *splendens* differs in its brilliant coloration, in its pronouncedly digitate structure, and in details of the characteristics of the asters.

The species name alludes to its beautiful appearance.

GENUS *JASPLAKINA*, new

This genus is here established to be at least temporarily within the family Jaspidae, but this allocation is open to considerable debate, because there is reason for placing this new genus in the family Halinidae near the genus *Astroplakina*. The type is to be the following new species, *Jasplakina nux*. This genus may be described as comprising sponges with oxeas of two or more distinct types, at least one of which is a microxea. There are euasters and also spicules which may be regarded either as very large euasters with few rays, thus justifying allocation in the family Jaspidae or contrariwise as being reduced calthrops or tetraxon spicules. In the latter case, the genus should belong in the family Halinidae.

Jasplakina nux, new

Text Figure No. 157

This species is here represented by the following:

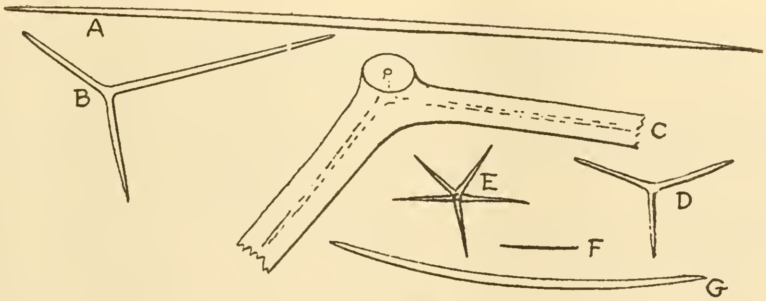
U.S.N.M. No. 23120, My No. M. 502, here designated as type, collected September 2, 1949, by diver in Komebail Lagoon of the Palaus northwest of Koror. The depth was 5 meters, and the substrate was dead coral.

This sponge is a rounded mass 6 by 8 cm in diameter and 5 cm high.

The exterior color in life was jet black; the endosome was pale drab. There was an area, about 1 mm thick, blending from the black color to the paler interior. After preservation in alcohol, the external color was still black, but the area of blending had shrunk noticeably so that the dark area had become only 200 μ thick. The consistency was like that of cheese, easily cut.

The surface is undulate, almost lobed, with abundant pores about 40 μ in diameter and 100 μ to 160 μ apart, center to center. The specimen has only three oscules, widely scattered, each about 6 mm in diameter.

The ectosome is separated from the endosome by definite subdermal



Text Figure No. 157. Spicules of *Jasplakina nux*. *A:* Oxea, X 182. *B:* Triact, X 182. *C:* Portion of a triact, one arm broken off sharply, X 782. *D:* Microtriact, X 782. *E:* Oxyeuaster, X 782. *F:* Raphide, X 782. *G:* Microxea, X 782.

canals. It is packed with the smaller spicules, and contains some of the triacts. From each of the pores, a canal descends into the sponge interior, practically perpendicular to the surface. These canals have a diameter of about 40 μ, like that of the pores. As they penetrate more deeply into the endosome, they branch frequently, and a somewhat confused structure results. There are numerous flagellate chambers which are eurypyllous, 40 μ by 60 μ in diameter. A suggestion of radiate structure is afforded by the fact that the largest spicules of the endosome are practically always perpendicular to the surface.

The skeleton comprises these above-mentioned large oxeas, about 12 μ by 830 μ in size. Also there are very numerous oxeas, about 2 μ by 100 μ, and very small microxeas, 0.5 μ by 25 μ. There are oxyeuasters with rather smooth rays, 15 μ to 36 μ in total diameter. These undoubted asters have four or more rays. Then there are spicules which may be regarded as euasters and have only three rays. Some of these spicules which give indication of being derived from the preceding category are only 22 μ in total diameter, the rays being about 12 μ long. A few are present which have still larger rays, and some occur with rays which are at least 6 μ by 250 μ. Furthermore, some broken fragments seem to indicate that there were also present triaxon spicules with rays as thick as 10 μ, and perhaps these may have been even longer than the above-mentioned 250 μ. The latter spicules obviously approach the calthrops condition, as found in the family Halinidae.

This sponge is quite unique, but may be compared to a certain extent with *Dorypleres biangulata* Lindgren, 1897, page 483, from the East Indies. This had larger oxeas and did not have the smallest microxeas nor the very distinctive large triaxon spicules. It was, however, similar in general appearance, and, in particular, it had the coloration of the species *nux*.

The name here selected is derived from the classical word indicating "night" and refers to the black color.

FAMILY SOLLASELLIDAE Lendenfeld
GENUS *OXEOSARCODEA*, new

The genus is here erected in the family Sollasellidae to receive as genotype the following new species or *Oxeosarcodea oinops.* It is characterized by having a spiculation of only oxeas; but it is especially peculiar because of the jelly basis of the sponge, a structure strongly reminiscent of sponges which are found in the order Carnosa. All in this latter order, however, possess asters. Within the family Sollasellidae, the genus *Sarcomella* Schmidt, 1868, page 1, type *S. medusa,* (from the Mediterranean) according to Schmidt's description would be a great deal like the present sponge, but Topsent, 1938, page 16, redescribes Schmidt's material as having only rather small oxeas. Furthermore, both Schmidt and Topsent agree that there was a corticate structure present in *Sarcomella,* which is absent from *Oxeosarcodea.*

The generic name selected refers, first, to the spiculation of oxeas, derived from the Greek word for "sharp pointed," and, second, from the Greek word for "flesh."

Oxeosarcodea oinops, new

Text Figure No. 158

This species is here represented by the following:

U.S.N.M. No. 22982, My No. M. 359, collected July 5, 1949, by diver in the miniature lagoon in the south corner of the lagoon at Ebon Atoll. The depth was 2 meters, and the substrate was dead coral. Several other specimens, dubiously of the same species, were observed in the immediate vicinity. These were difficult to compare with the specimen which is here used as type, because of their small size. The type specimen is 4 cm high and 9 cm in diameter, massive in shape.

Text Figure No. 158. Spicule (oxea) of *Oxeosarcodea oinops,* X 182.

The exterior color in life was port wine red. This color extended only a few μ deep into the sponge, the entire endosome being very pale drab. The red color faded very little when placed in alcohol, but the alcohol was turned green. The consistency was between that of jelly and that of cheese.

The surface is uneven and might be called micro-conulose. The pores are 135 μ to 270 μ in diameter and are very close together, often with partitions narrower than the diameter of the pores themselves. The oscules are very few, only one certain oscule could be found; this was 5 mm in diameter.

There is no separable ectosome, the jelly of the endosome merely stops without any subdermal spaces. The endosome consists primarily of a dense

mass of jelly, which is perforated by the meandering canals. There are very numerous small flagellate chambers which are spherical and only 20 μ in diameter. In the jelly there are scattered spicules and also a few vague tracts about 50 μ in diameter. These contain about 6 to 10 spicules per cross section and apparently no spongin at all. Their surface terminations are responsible for the microconulose structure mentioned above.

The skeleton is principally mesogloea or jelly, but the mineral skeleton comprises oxeas about 8 μ by 620 μ. A very few of these are modified to appear as strongyles, but this is here regarded as an accidental situation.

This species may be compared to species of the genus *Axinyssa,* which is in the same family, but is characterized by having dermal erect microxeas. It might seem appropriate to name the new genus *Pseudaxinyssa,* because of its resemblance to the older genus, but this name has already been used for a genus in the Axinellidae. Several species now in other genera should be referred to *Pseudaxinyssa* at the present time. They are as follows: *Acanthella ehrenbergi* Keller, 1889, page 395; *Acanthella flabelliformis,* Keller, 1889, page 394; *Acanthella multiformis,* Vosmaer, 1885, page 25; and *Axinyssa aculeata,* Wilson, 1925, page 445. It is possible that the genus *Pseudaxinyssa* should be further subdivided to afford a special place for those species now in that genus which are set off by symmetrical, fan-like or flabellate shape. This action is not taken at the present time.

The specific name, *oinops,* is the Greek word meaning "wine dark" and is selected because of the characteristic color of this sponge.

FAMILY TETHYIDAE Gray

GENUS *TETHYA* Lamarck

Tethya viridis (Baer) de Laubenfels

Text Figure No. 159

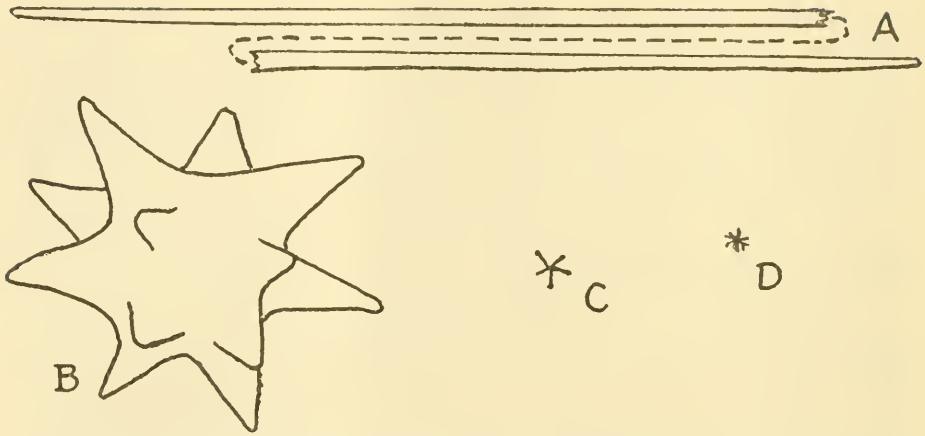
This species is here represented by the following:

U.S.N.M. No. 22973, My No. M. 349, collected July 5, 1949, by diver in the Pearl Pool at the west end of the lagoon at Ebon Atoll. The depth was 5 meters, and the substrate was dead coral. This species was quite common throughout the waters of Ebon lagoon.

This sponge is almost spherical and about 2 cm in diameter.

The exterior color in life was often black and the interior always ochraceous yellow. The specimens fade to pale lavender in alcohol. The consistency was cartilaginous.

The surface is tuberculate with tubercles, about 1 mm high and a little more than 1 mm in diameter, crowded together so that the grooves between them are quite narrow. The pores were probably located in these grooves but are closed in the specimen so that the oscules cannot be made out.



Text Figure No. 159. Spicules of *Tethya viridis*. *A:* Strongyle, X 182. *B:* Spheraster, X 782. *C:* Chiaster, X 782. *D:* Euaster, X 782.

The ectosome consists of a cortex, 1.5 mm thick. The endosome is fleshy and strongly radiate, with tracts of spicules.

The megascleres are strongyloxeas, as typical of the genus *Tethya*, dimensions about 13 μ by 1100 μ. The microscleres include, first of all, large spherasters with coarse spines. They are about 5 μ in diameter and have very numerous rays. The others, about 7 μ in diameter, have only about 10 to 15 rays. These latter seem to be chiasters.

This species was first described as *Donatia viridis* by Baer, 1905, page 26, from the southwest Pacific. All efforts to determine its world distribution are confused by the fact that various authors, quite understandably, find difficulty in separating *viridis* from *diploderma*. The two may indeed be conspecific, but *viridis* more often is green or black on the exterior.

Tethya diploderma, Schmidt

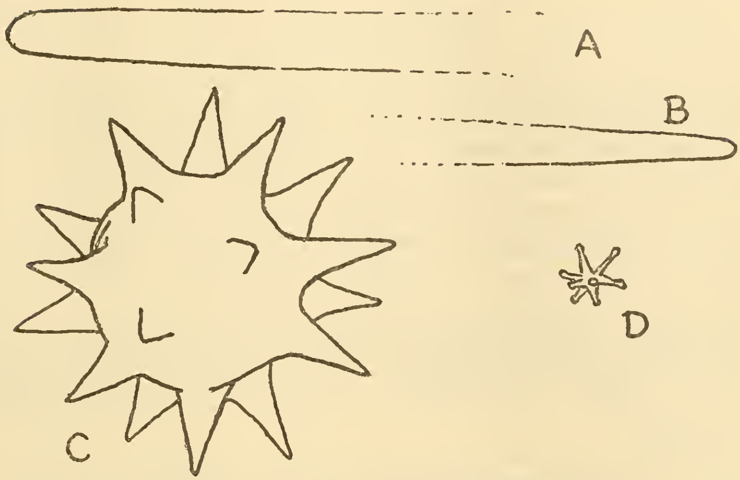
Text Figure No. 160

This species is here represented by the following:

U.S.N.M. No. 22862, My No. M. 156, collected July 11, 1949, by diver near the south corner of the lagoon near the church at Likiep Atoll. The depth was 3 meters, and the substrate was dead coral.

U.S.N.M. No. 22865, My No. M. 159, collected July 11, 1949, at the same locality as the previous specimen.

U.S.N.M. No. 22872, My No. M. 167, collected July 13, 1949, by diver near the south side of the lagoon near Eotli Islet at Likiep Atoll. The depth was 5 meters, and the substrate was dead coral. It was found inside a large cavity of the coral, to which there was an exceedingly small entrance.



Text Figure No. 160. Spicules of *Tethya diploderma*, X 782. *A* and *B:* Terminations of the strongyle, mid portion not shown. *C:* Spheraster. *D:* Tylaster.

This species is spherical and about 2 cm in diameter.

The ectosome color in life varied from yellow through orange to red. The interior varied only from yellow to orange-yellow. The consistency was stiff and cartilaginous.

The surface is tuberculate, with tubercles 1 or 2 mm high and 1 or 2 mm in diameter, separated from each other by only narrow grooves. The pores and oscules could not be made out, because they are very readily closed. They may be expected to be in the grooves between the above-mentioned tubercles.

The ectosome is a pronounced cortex, with two distinct layers—hence the specific name, *diploderma.* The endosome is strongly radiate.

The skeleton consists of strongyloxeas which are definitely inequiended. These range up to at least 20 μ by 2000 μ in dimensions. The microscleres include relatively large spherasters, about 60 μ to 65 μ in diameter, and also include small euspherasters 15 μ in diameter. These have very numerous rays. A second category of microscleres is a small euaster with tylote modifications to the rays, so that it may be called a tylaster. This type is 6 μ to 10 μ in diameter and has usually only from 5 to 10 rays.

This species was first described as *Tethya diploderma* by Schmidt, 1870, page 52, from the West Indies, but it has since been recorded from practically all the warmer waters of the world so that it may fairly be called circum-equatorial.

Tethya actinia de Laubenfels

Text Figure No. 161
Plate XI, Figure c

This species is here represented by the following:

U.S.N.M. No. 22977, My No. M. 353, collected July 5, 1949, by diver from the Pearl Pool at the west end of the lagoon at Ebon Atoll. The depth was 5 meters, and the substrate was dead coral. This species was moderately common throughout the lagoon of Ebon Atoll.

U.S.N.M. No. 22820, My No. N. 027, collected August 17, 1949, by F. M. Bayer on the outer reef near Bikini Islet at Bikini Atoll.

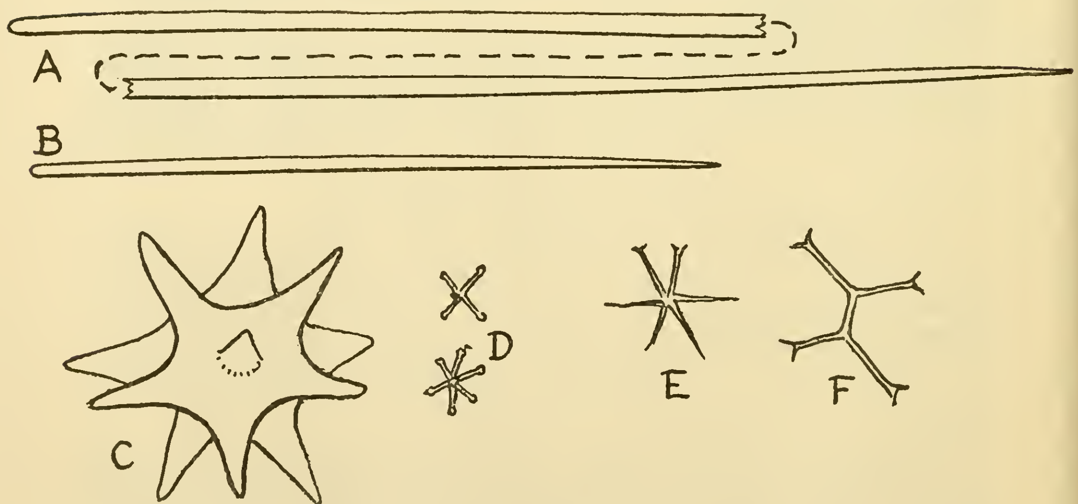
This species is spherical and about 2 cm in diameter.

The color in life was brilliant red, becoming nearly white upon being immersed in alcohol. The endosome was deep orange, and the consistency was cartilaginous.

The surface is tuberculate, as in all species of *Tethya,* with tubercles about 2 mm in diameter and upwards of 1 mm high. Some of these at Ebon had long projections (incipient buds), which indicates an approaching reproductive cycle. The pores and oscules cannot be made out, because they close in the process of collection.

The ectosome is corticate, about 1 mm thick; and the endosome is pronouncedly radiate.

The skeleton comprises megascleres which are practically styles, being fairly sharply pointed at one end. This is somewhat unusual in the genus



Text Figure No. 161. Spicules of *Tethya actinia.* *A:* Style, X 182; the entire spicule shows, but in two parts. *B:* Smaller style, X 182. *C:* Spheraster, X 782. *D:* Tylasters, X 782. *E:* Oxyeuaster with forked rays, X 782. *F:* Greatly modified oxyaster with forked rays, X 782.

Tethya. Their dimensions are 11 μ by 500 μ to 17 μ by 1250 μ. The microscleres include the usual dermal spherasters, in this case about 55 μ in diameter, and also include small asters scattered through the flesh. These latter are eutylasters about 6 μ to 10 μ in diameter; some have only four or five rays, more have eight or ten rays. In addition, there are abundantly present oxyspherasters, about 25 μ in total diameter, of which it is true that one or more of the rays of each spicule have a dichotomous branching a short distance from the end.

This species was described as *Tethya actinia* by de Laubenfels, 1950, page 116, from Bermuda, and is sharply characterized by the dichotomous branching to the ends of the rays of the intermediate sized asters. Brøndsted, 1934, page 5, described it as occurring in the East Indies, but he erroneously identified his specimens as being *T. diploderma.* The species is probably circumequatorial.

GENUS *LIPASTROTETHYA,* new

This genus is here established in the family Tethyidae, to have as type the following new species, *Lipastrotethya ana.* It is characterized by being exceedingly like *Tethya* in general appearance, fleshy structure, and megascleres, but differs sharply by complete lack of the characteristic microscleres.

The generic name selected is derived first from a Greek prefix meaning "without," and second with reference to the word "aster," and third to the genus *Tethya.* That is to say, this is *Tethya* without asters.

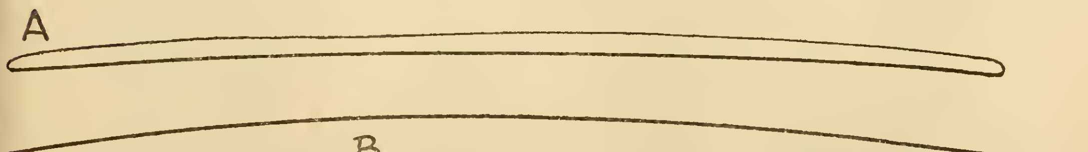
Lipastrotethya ana, new

Text Figure No. 162

This species is here represented by the following:

U.S.N.M. No. 23094, My No. M. 476, here designated as type, collected August 17, 1949, by diver in the northeast corner of the lagoon in the lee of Givry Islet at Kuop Atoll. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 23096, My No. M. 478, collected at the same time in the same general vicinity.



Text Figure No. 162. Spicules of *Lipastrotethya ana,* X 182. *A:* Strongyle. *B:* Filamentous spicule, which may be a juvenile strongyle.

This is an irregularly rounded mass: in the first case, 6 by 8 by 16 cm, and in the second case, about 4 by 6 cm.

The exterior color in life was golden brown with a slightly greenish subcutaneous layer. The interior was pale brown to yellow. The consistency was cartilaginous.

The surface is tuberculate, with tubercles about 2 mm high and 3 mm in diameter. It is somewhat hispidated by scattered protruding spicules. The pores and oscules cannot be made out, because they close at the time of collection; but as in *Tethya* they doubtless occurred in the narrow valleys between the surface tubercles.

The ectosome is corticate, 0.5 to 1 mm in thickness. The endosome may be called radiate; but, as in all large sponges of fundamentally radiate type, the structure shows plainest near the surface, whereas the interior has its spicules more or less in confusion.

The skeleton consists primarily of strongyloxeas, as in *Tethya,* 20 μ by 700 μ in dimensions. Much thinner forms occur in small numbers but are probably merely juvenile or developmental forms. Some of these are as little as 3 μ in diameter but as much as 850 μ long. Intermediates occur between these and the obviously mature spicules.

The species name *ana* is selected merely as a concise name without especial significance.

ORDER CHORISTIDA Sollas

FAMILY ANCORINIDAE Gray

GENUS *HEZEKIA* de Laubenfels

Hezekia walkeri, new

Text Figure No. 163

This species is here represented by the following:

U.S.N.M. No. 22925, My No. M. 231, here designated as type, collected September 1, 1949, by divers in Iwayama Bay, Koror, in the Palaus. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 23054, My No. M. 434, collected August 1, 1949, by diver in east Ponapé (Matalanim) from a reef in the lagoon near an entrance to the lagoon. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 22871, My No. M. 166, collected July 11, 1949, by diver near the east end of the lagoon near Lado Islet at Likiep Atoll. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 22870, My No. M. 165, collected the same date and general locality as the preceding.

U.S.N.M. No. 23006, My No. M. 386, also collected the same date and general locality as the preceding two specimens.

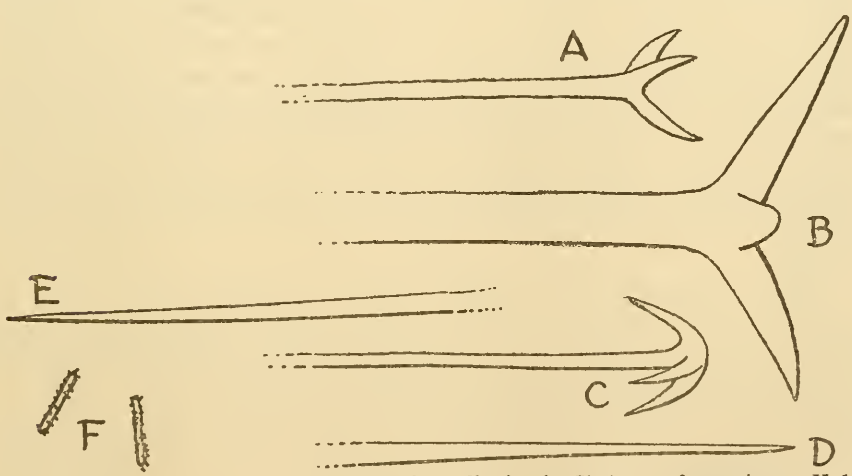
U.S.N.M. No. 22863, My No. M. 157, collected July 11, 1949, by diver near the southeast corner of the lagoon near the church at Likiep Atoll. The depth was 3 meters, and the substrate was dead coral.

U.S.N.M. No. 22812, My No. N. 018, collected May 21, 1946, by J. P. E. Morrison at Eniwetok Atoll from the flats behind the outer reef at the east end of Jeiroru Islet in the east portion of the lagoon, opposite an entrance to the lagoon.

U.S.N.M. No. 22822, My No. N. 029, collected August 17, 1947, by F. M. Bayer from the outer reef near Bikini Islet at Bikini Atoll.

This species is massive but somewhat irregular in shape. No. M. 166 had, rising from it, one cylindrical flat-topped or truncated process, about 4 cm high and 2 or 3 cm in diameter. The largest of the specimens was No. M. 434, which was 15 cm high and 12 by 20 cm in lateral dimensions. Much larger specimens probably occur in the field.

The exterior color in life, of the specimens from the Palaus and from Ponapé varied from brown to orange, with an endosome which was bright lemon yellow in life. This latter, however, within 5 seconds after being cut, turned blue black on the newly exposed surfaces. This blackness penetrated hardly at all. Even after standing overnight, the depth reached by the blue black color was scarcely thicker than that of a sheet of paper. Of the specimens collected at Likiep, the endosome of No. M. 157 reacted exactly like the endosome of the specimens from the more western islands, but the ectosome was bright yellow. All the others from Likiep had a greenish tint throughout the interior which may, however, be due to the presence of small quantities



Text Figure No. 163. Spicules of *Hezekia walkeri*. *A:* Cladome of protriaene, X 182. *B:* Cladome of plagiotriaene, X 182. *C:* Cladome of anatriaene, X 182. *D:* Outer end (among cladomes) of oxea, X 182. *E:* Inner end of oxea of the rhabd of any sort of triaene, X 182. *F:* Microspined rod-like microscleres, X 782.

of unicellular algae. In other respects they were much like the type specimen. The consistency was cartilaginous, though spicules could be felt by the fingertips.

The surface of this species is in places smooth and in places hispid. Some specimens are smooth nearly all over, but Specimen No. M. 386 was hispid nearly all over. The regions not covered by projecting spicules are shiny smooth. The pores are extremely contractile, probably very numerous and small. Oscules are also very difficult to make out, but in the type specimen there were a few apertures, 2 to 10 cm in diameter, quite readily observed. On the other hand, it is by no means certain that these are oscules, because they may be accidental or fortuitous punctures.

The ectosome is typically corticate, about 0.7 mm thick. The inner boundary of this cortex is sharply marked off from the endosome, but it is uneven. It is characterized by projections about 20 μ in diameter, 30 μ long, and about 40 μ apart, summit to summit. These projections interdigitate with similar ones from the endosome. The endosome itself is vaguely radiate but is rather crumb-of-bread, or microcavernous, with many spicules in confusion. The plagiotriaenes, however, are quite distinctly radiate in placement with their cladomes immediately below the cortex and parallel to it.

The skeleton comprises first oxeas of great size variation, ranging from as small as only 4 μ by 240 μ (which is rare) to as large as 40 μ by several thousand μ (which is more common). Very many are between 20 μ by 1000 μ and 40 μ by 2000 μ. There are plagiotriaenes, with clads up to as much as 40 μ by 170 μ and rhabds 40 μ by several thousand μ long. Protriaenes are probably always present, but they are rare and were found only in Specimens No. M. 231, M. 165, and M. 157. These have clads about 8 μ by 50 μ and rhabds 8 μ by 1000 μ, more or less. The anatriaenes are more consistently present. They have clads about 15 μ by 150 μ or less and rhabds 15 μ by 1500 μ, more or less. The most characteristic spiculation is that of the microscleres. These are straight rhabds, about 10 μ to 13 μ long and 1 μ to 1.5 μ in diameter. They are covered all over with very minute spines. These spicules, instead of having pointed terminations, or even rounded ones (as is true of strongyles), come to extremely sharply cut-off or flat ends. This is remarkable.

The genus *Hezekia* was established by de Laubenfels, 1934, page 4, for the one species *H. demera,* from the West Indies. The present species, *walkeri,* differs from the earlier one chiefly in the shape of the microrhabds. Those of *demera* were sharply pointed at the end, and smaller, being only 1 μ by 5 μ to 1 μ by 8 μ. The coloration of *demera* was very dull, showing none of the distinctive hues exhibited by *walkeri.*

The specific name is given in honor of the late Mr. H. D. Walker.

GENUS *MYRIASTRA* Sollas

Myriastra purpurea (Ridley) de Laubenfels

Text Figure No. 164

This species is here represented by the following:

U.S.N.M. No. 22979, My No. M. 356, collected July 5, 1949, by diver from the Pearl Pool in the west portion of the lagoon at Ebon Atoll. The depth was 3 meters, and the substrate was dead coral.

U.S.N.M. No. 22988, My No. M. 366, collected July 5, 1949, by diver from the miniature lagoon in the south portion of the lagoon at Ebon Atoll. The depth was 2 meters, and the substrate was dead coral.

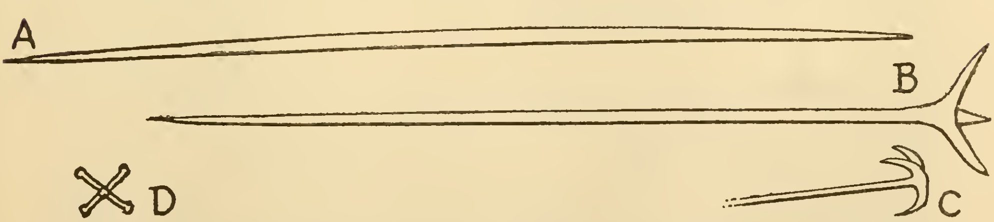
This species is cake-shaped or slightly lobate, about 2 mm thick and 3 to 5 mm in diameter.

The exterior color in life was dull maroon to purple. This maintained itself moderately well in alcohol, which became tinted with green. The interior was pale yellowish drab. The consistency was between cartilaginous and spongy.

The surface is tuberculate to microhispid, slightly rough and uneven. The pores are closed and must have been very small. Oscules up to 2 mm in diameter can be found near the edge of the mass but in very small numbers.

The ectosome is a dense cartilaginous cortex about 0.5 mm thick. The endosome is radiate in structure and microcavernous.

The skeleton consists first of oxeas, about 11 μ by 660 μ and second of plagiotriaenes with rhabds about 10 μ by 600 μ and clads about 10 μ by 60 μ to 11 μ by 70 μ. There are also numerous anatriaenes with rhabds about 8 μ by 500 μ and clads about 8 μ by 26 μ. In Specimen No. M. 366, these are so strongly curved that their points almost come back to touch the rhabd. The protriaenes (which are probably present) were not found. The microscleres are quite characteristic of the species *purpurea,* but they are astonishingly rare. In No. M. 356, only one was discovered. This is a eutylaster, 12 μ in diameter. In No. M. 366, these asters are somewhat more common but are still to be described as rare. Some are as large as 12 μ, but some are as small as 3 μ in total diameter.



Text Figure No. 164. Spicules of *Myriastra purpurea. A:* Oxea, X 182. *B:* Plagiotriaene, X 182. *C:* Cladome of anatriaene, X 182. *D:* Tylaster, X 782.

This species was first described as *Stelletta purpurea* by Ridley, 1884, page 473, from the East Indies. Burton in 1926, page 44, and following, reduces a very large number of other species names of *Myriastra* into synonymy with *purpurea,* thus tending to show that it is a cosmopolitan or at least circumequatorial species. It may be that some of these names were unduly reduced in synonymy, but certainly most of them are correctly allocated by Burton. The species is definitely abundant throughout the Indian Ocean, Australian, East Indian, and Pacific regions in general.

FAMILY CRANIELLIDAE de Laubenfels
GENUS *CINACHYRA* Sollas
Cinachyra porosa (Lendenfeld) Burton

Text Figure No. 165
Plate XI, Figure b

This species is here represented by the following:

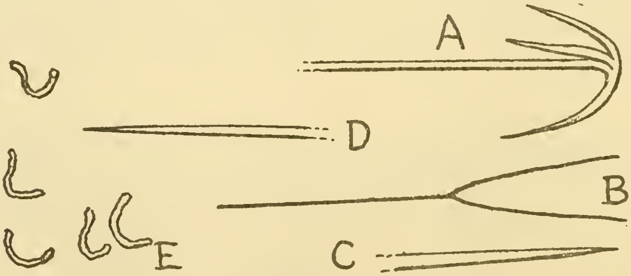
U.S.N.M. No. 23138, My No. M. 522, collected September 15, 1949, by diver in southwest Saipan inside the reef offshore from Charan Kanoa Village. It was common there, but absent elsewhere. The depth was 2 meters, and the substrate was sand. This species was also found in the middle of the west shore of Guam, at Dungas Bay, September 20, 1949.

U.S.N.M. No. 22914, My No. M. 219, collected September 1, 1949, by diver in Iwayama Bay, Koror, in the Palaus. This was in muddy water near mangroves at a depth of between 1 and 2 meters, and the sponges were not attached, but lying loose on the bottom.

This species is subspherical, 3 or 4 cm thick and about 6 cm in diameter.

The color in life was dirty yellow on the exterior and bright yellow in the interior. The consistency was cartilaginous.

The surface is strongly hispid with projecting spicules thickly placed over the entire exterior, extending 4 to 5 mm beyond the surface of the



Text Figure No. 165. Spicules of *Cinachyra porosa*. *A:* Cladome of anatriaene, X 182. *B:* Cladome of prodiaene, X 182. *C:* Outer end (among cladomes) of oxea, X 182. *D:* Inner end of oxea, or of the rhabd of any sort of triaene or diaene, X 182. *E:* Five of the sigmaspires, X 782.

sponge. The pores are arranged in poral calyces, which are each about 4 by 7 mm in dimensions and about 5 mm deep. These are arranged in a row, which usually makes an equatorial belt around the sponge at its widest diameter. The oscules are very contractile and difficult to locate, being situated usually about the middle of the top of the sponge. The ectosome is a muscular cortex, nearly 1 mm thick. The endosome is pronouncedly radiate in structure.

The skeleton comprises oxeas up to 50 μ thick and at least 8 or 9 mm long. In some specimens, they reach only to a somewhat smaller size but are still relatively enormous. There are also anatriaenes, consistently present, with clads about 5 μ by 100 μ and rhabds about 5 μ by 1500 μ. In No. M. 219, a few prodiaenes were found with clads 4 μ by 125 μ, and rhabds, about 6 μ by perhaps 1 mm in length. The microscleres are strongly contorted sigmaspires which are about 2 μ thick and 8 μ to 12 μ in chord length. If straightened out, this spicule would be approximately 20 μ to 25 μ long. The spination on it is very fine indeed, requiring oil immersion for clear observation.

Lendenfeld in 1888, page 43, established a species which he called *Spiretta porosa* for Australian sponges. This was put into *Cinachyra*, properly, by Burton, 1934, page 526.

Cinachyra australiensis (Carter) Burton

Text Figure No. 166

This species is here represented by the following:

U.S.N.M. No. 23039, My No. M. 418, collected July 30, 1949, by diver in northwest Ponapé in the lagoon near the shore. The depth was 3 meters, and the substrate was dead coral fragments. This species was common in Ponapé.

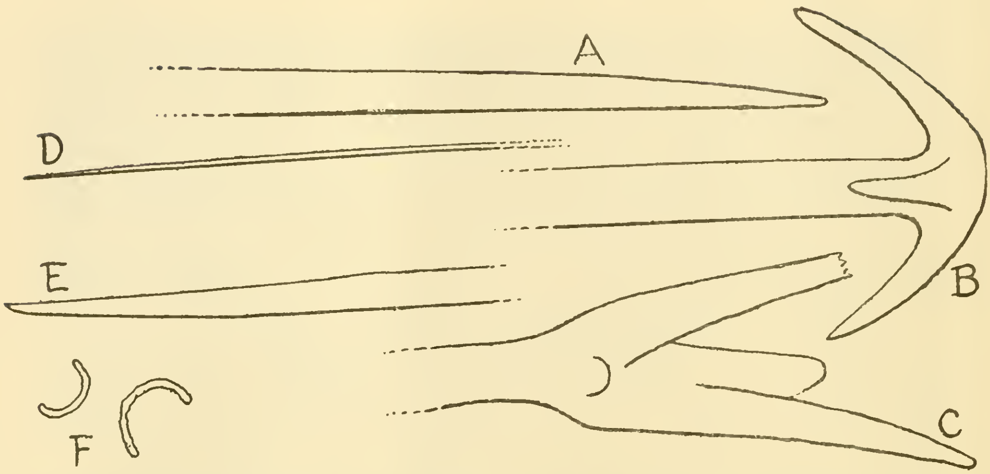
U.S.N.M. No. 22903, My No. M. 207, collected August 13, 1949, by diver in the west part of Truk Lagoon at Lemotol Bay. The depth was 4 meters, and the substrate was coral sand. This species was also common in Truk.

U.S.N.M. No. 22814, My No. N. 020, collected March 7, 1946, by J. P. E. Morrison at Bikini Atoll under rocks in low intertidal zone near Bikini Islet. This sponge is identified with grave doubts. Its microscleres are very small, only about 6 μ in chord length, and, therefore, it may be that it should be put in a new species.

T. E. Bullock in 1948 collected at Bikini Atoll at least two sponges which are conspecific with the preceding and thus dubiously here classified as *Cinachyra australiensis*. Their microscleres were only 5 μ in chord length.

Cinachyra australiensis, like most others in this genus, is subspherical, about 3 to 6 cm thick and 4 to 8 cm in diameter.

The color in life was dirty yellow externally and bright yellow internally. The consistency was mediocre to cartilaginous.



Text Figure No. 166. Spicules of *Cinachyra australiensis,* X 782. *A:* Outer end of the oxea. *B:* Cladome of anatriaene. *C:* Cladome of a somewhat abnormal protriaene. *D:* Inner end of a thin spicule, perhaps oxeote, probably a triaene. *E:* Inner end of an oxea. *F:* Two of the sigmaspires.

The surface is conspicuously hispid. The pores are in poral calyces about 3 by 6 mm in lateral dimensions and 4 mm deep. These are usually (but not quite always) arranged in an equatorial placement around the sponge. The oscules are contractile and difficult to notice, but in No. M. 418 a large oscule could readily be made out in the freshly collected specimen. This was on the middle of the upper surface. It attained a diameter of more than 1 cm, and branched immediately into a number of subdermal canals, about 2 mm in diameter, so that it might almost be regarded as a cloaca, receiving these oscules.

The ectosome is a cortex nearly 1 mm thick; the endosome is pronouncedly radiate.

The skeleton consists of exceedingly long oxeas up to at least 34 μ in diameter and at least 7 to 9 mm in total length. There are also fairly numerous anatriaenes with clads, about 6 μ by 50 μ, and rhabds, 5 μ to 10 μ in diameter and 1 or more mm long. In No. M. 207, a few protriaenes could be found, with clads up to 10 μ by 60 μ and rhabds 10 μ by more than 1000 μ. The microscleres include microxeas or raphides, 1.5 μ by 150 μ, and sigmaspires, 14 μ to 20 μ in chord length. These are less than 1 μ in thickness and are only ultramicroscopically roughened. They are not so pronouncedly contorted or spiral in shape as are those in the preceding species.

This sponge was originally described as *Tethya cranium,* variety *australiensis,* by Carter, 1886, page 127. It was first treated as a species, called *Tetilla australiensis,* by Sollas, 1888, page 43. It was correctly transferred

to *Cinachyra* by Burton, 1934, page 523. It is set off from *porosa* by the thinner and less contort microscleres. Carter described it from Australia, and it is especially common throughout that and the East Indian region.

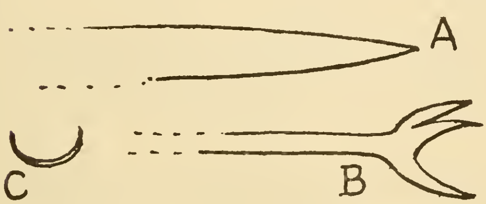
GENUS *CRANIELLA* Schmidt

Craniella abracadabra, new

Text Figure No. 167
Plate XII, Figure a

This species is here represented by the following:

U.S.N.M. No. 23044, My No. M. 423, here designated as type, collected August 1, 1949, by diver in east Ponapé (Matalanim) from a reef in the lagoon near an entrance to the lagoon. The depth was 5 meters, and the specimen was not attached. It was loose or free from attachment in life.



Text Figure No. 167. Spicules of *Craniella abracadabra,* X 782. *A:* Termination of an oxea. *B:* Clađome of a protriaene. *C:* Sigmoid microsclere.

This is a spherical sponge, having a central mass 3 cm in diameter. Because of the great projections, the total sponge is 6 cm in diameter.

The color in life was dark drab on the exterior and paler and more yellowish drab in the interior. The consistency of the central portion was rather cartilaginous, but the conspicuous projections were very flexible.

The surface is completely covered by relatively enormous processes, only 3 mm apart. Each is 1 to 2 mm in diameter and 12 to 20 mm long or high.

The pores were all closed and could not be made out. Only a single oscule could be found. It was near the upper surface of the sponge and was 3 mm in diameter.

The ectosome is entirely fleshy, practically devoid of spicules. Its thickness is about 1 mm but is difficult to measure, because it blends into the endosome. The latter is extremely radiate, marked by fascicular columns of many scores of spicules per cross section. The tract diameter is nearly 1 mm. These columns or tracts continue from their radiate placement from within the centrum, on out into the projections. Each of the latter contains one spicular tract. There are practically no spicules at all in the fleshy regions between these fascicular columns.

The skeleton comprises oxeas, 3 μ by 2000 μ to 30 μ by 6000 μ or more. There are also some protriaenes with clads, 5 μ by 20 μ, and rhabds, 5 μ by 1000 μ, more or less. The microscleres are simple sigmaspires, very little contorted, 12 μ in chord length. The spination on them is so fine that even with high power they appear smooth.

This species is quite unique for the extreme development of the spinous processes on the surface. Wilson, 1925, page 361, described a sponge as *Tetilla spinosa* which was properly transferred to *Craniella* by de Laubenfels, 1936, page 171. There was, however, already a *Craniella spinosa,* of Lambe, 1893, page 35. Therefore, a new name is required for *spinosa* of Wilson. It is here proposed that it be denominated *Craniella wilsoni,* new name.

The word *abracadabra* is often used in pseudo-magic incantations and seems to me appropriate in view of the bizarre appearance of this sponge.

GENUS *PARATETILLA* Dendy

Paratetilla lipotriaena, new

Text Figure No. 168

This species is here represented by the following:

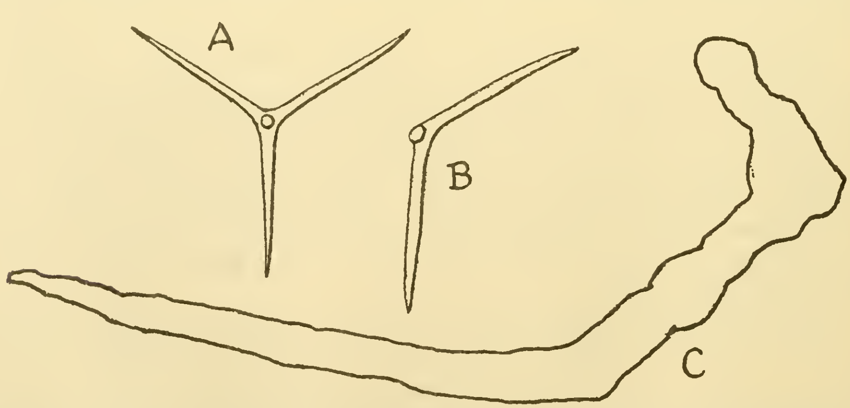
U.S.N.M. No. 23049, My No. M. 428, here designated as type, collected on August 1, 1949, by diver in eastern Ponapé (Matalanim) from a reef in the lagoon near an entrance to the lagoon. The depth was 5 meters, and the substrate was dead coral.

Three subspherical specimens were found close together, each about 1 cm high and a little over 1 cm in diameter.

The color was dark gray and the consistency stiff.

The surface would be smooth except that long spicules protrude to a distance of between one and two mm. They are scattered so that they are often more than 1 mm apart. The sponges in alcohol appear lipostomous. Doubtless contractile openings have closed.

There is a thin, ill-defined cortex. It may be said to be about 50 μ thick, but it is difficult to measure because of its lack of sharp definition. The endo-



Text Figure No. 168. Spicules of *Paratetilla lipotriaena. A:* Tetraxon, X 182. *B:* Broken triaxon, X 182. *C:* One of the characteristically deformed spicules, X 782.

some is distinctly radiate, with long spicules perpendicular to the surface extending in vague tracts outward from a central point.

The skeleton shows first these very long oxeas, often 21 μ in diameter and 3 to 5 mm in length. A second type of megasclere is also very abundant. It is usually a tetraxon of the calthrops type (all four rays approximately equal). Nevertheless, some of these spicules are only triaxon. In the latter case, the rays are not all in one plane, as in the case of calcisponge triacts, but are arranged as though they were three rays of a typical calthrops (the fourth ray being missing). The rays of these spicules are often 9 μ by 135 μ in size. Among them are numerous deformed spicules, perhaps to be regarded as modified calthrops. Their rays are commonly bent several times at sharp angles, and are irregularly swollen here and there. The microscleres are abundant sigmaspires, 12 μ in chord length, and in appearance are quite typical of the family Craniellidae.

This species is sharply set off from all others in the genus by its lack of either anatriaenes or protriaenes, both of which are typically present. Perhaps a few such might be discovered if a large fraction of the specimens were boiled out in nitric acid, but in this case it would still be appropriate to characterize the present species as notably deficient in triaenes. The species name selected refers to this lack.

There is one other species of *Paratetilla* which is clearly very closely related to *lipotriaena.* This is *P. eccentrica,* Row, 1911, page 306, from the Red Sea. It also has the curiously deformed spicules abundantly present but is well provided with triaenes.

ORDER CARNOSA Carter (or CARNIDA*)

FAMILY HALINIDAE de Laubenfels

GENUS *SAMUS* Gray

Samus anonyma Gray

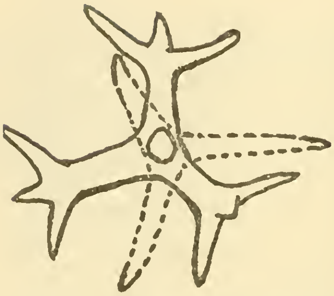
Text Figure No. 169

This species is here represented by a spicule in a microscopic preparation which is, at present, in my collection. This spicule was taken from my Specimen No. M. 499, *Cliona schmidtii.*

This was collected on September 2, 1949, by divers in Komebail Lagoon, northwest of Koror, in the Palaus. The depth was 5 meters, and the substrate was dead coral.

Gray, 1867, page 526, described *Samus anonyma* from the West Indies, as a sponge occurring in the burrows of *Cliona,* but separate from the *Cliona.* It is sharply characterized by peculiar spicules which are amphitriaenes; that is to say, there is a short central rhabd and three clads at each end. These clads often have the "dicho" modification. In the case of this *Samus* from the

* See footnote on page 4.



Text Figure No. 169. Spicule (amphitriaene) of *Samus anonyma,* X 782.

Palaus, the species was again found in a *Cliona* burrow, but only some of the spicules could be located so that no data is available as to the protoplasmic portion. In fact, the sponge may have died and left only some of the spicules in the burrow. This can be rather confidently identified as *Samus anonyma,* simply because, up to date, no other species has been found to have similar spicules. *Anonyma* has been recorded not only from the West Indies but also from the Indian Ocean and Australian regions, and it is probably circum-equatorial. It is doubtless much more common than the published records would seem to indicate. Because of its cryptic location, it tends to be overlooked, and it is remarkable that specimens are ever found. It is doubtful if any sponges of this species are ever much larger than a grain of sand, or a grain of wheat at the most.

GENUS *PLAKORTIS* Schulze

Plakortis simplex Schulze

Text Figure No. 170

This species is here represented by the following:

U.S.N.M. No. 22832, My No. M. 108, collected June 20, 1949, by diver at Ailing-lap-lap Atoll in the channel between the lagoon and the ocean east of Bikájela Islet. The depth was 10 meters, and the substrate was dead coral.

This is an incrusting sponge, about 1 cm in diameter and less than 1 mm thick.

The color in life was bright rosy lavender on both exterior and interior, and the consistency was soft.

The surface is smooth, but microscopically roughened. The pores are closed and, therefore, do not show.

Text Figure No. 170. Spicules of *Plakortis simplex,* X 782.

The ectosome is a thin fleshy dermis, and the whole endosome is, as characteristic of the genus, very densely fleshy with the general appearance and somewhat the feeling of meat.

The skeleton is quite typical of the genus and species. It consists altogether of spicules which probably are either actually triaxons, or reduced triaxons. Some of these are quite regular with rays about 1.5 μ by 25 μ. Others have rays which are bent at very distinct angles with two or three bends per ray. These rays are often as large as 2 μ by 30 μ. Another type of spicule which is very common appears to be two such bent rays with the third one very short or suppressed. The effect is at first like that of an exceedingly crooked oxea, but it is dubious if any genuine oxeas are present in this species.

This species was first described by Schulze, 1880, page 430, from the Mediterranean region. It has since been recorded by many authors in places quite around the world and may be described as a circumequatorial sponge.

Plakortis lita, new

Text Figure No. 171

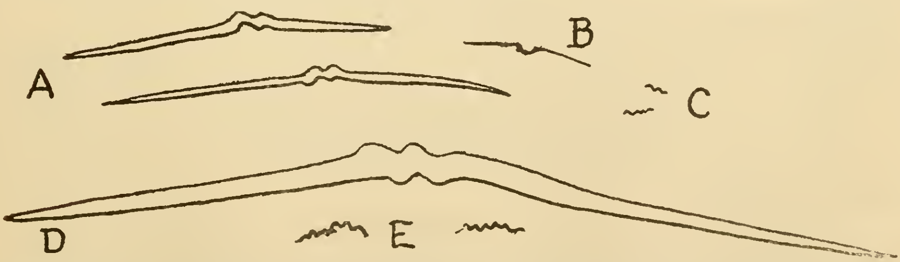
This species is here represented by the following:

U.S.N.M. No. 23069, My No. M. 449, here designated as type, collected August 10, 1949, by diver near Moen Islet in Truk Lagoon. The depth was 3 meters, and the substrate was dead coral.

U.S.N.M. No. 23033, My No. M. 412, collected July 30, 1949, by diver in northwest Ponapé between the reef and shore. The depth was 5 meters, and the substrate was dead coral.

U.S.N.M. No. 23045, My No. M. 424, collected August 1, 1949, by diver in eastern Ponapé (Matalanim) from a reef in the lagoon near an entrance to the lagoon. The depth was 5 meters, and the substrate was dead coral. This is not a common species.

The species is semi-incrusting, from 1 to 2 cm thick and often as much as 18 cm in lateral dimension.



Text Figure No. 171. Spicules of *Plakortis lita. A:* Larger spicules, X 782. *B:* Smaller spicule, X 782. *C:* Much bent, dubiously spiral microscleres, X 782. *D:* Typical megasclere, X 1,564 (oil immersion). *E:* Microscleres, X 1,564 (oil immersion).

The ectosome color in life is a dark dull red, and the endosome a lighter, brighter red, like fresh beef liver. The consistency is also exceedingly like that of fresh mammalian liver.

The surface is very smooth, but in life there are pores 30 μ to 50 μ in diameter and about 60 μ apart. The oscules are very few in number but as much as 4 mm in diameter when fully opened. These are contractile, and in many specimens are closed upon collection.

The ectosome is a thin, very fleshy dermis, and the endosome is also densely fleshy, like mammalian meat or liver tissue. The flagellate chambers are about 30 μ in diameter.

The skeleton comprises megascleres which are much like many that are found in the genus *Plakortis,* species *simplex,* which spicules are regarded as being reduced triaxons. These are ostensibly oxeas, but are bent about three times near the middle of the spicule. In none of the specimens of *Plakortis lita* which were studied could even a single triaxon be found. This is quite remarkable. It is even more noteworthy that in almost every specimen, there are such unusual microscleres that it is almost suitable to erect a new genus for the species *lita.* In some of the specimens the microscleres are as much as 7 μ long, but in the type specimen they are only 5 μ long. These need to be studied with oil immersion and, even so, each appears to be merely a many times bent rod, less than 0.5 μ in diameter. There are commonly from 12 to 15 sharp bends. The possibility exists that this is a spiral spicule, but this was not the impression obtained under the microscope.

This species is unique for its microscleres and also for the complete lack of triaxon spicules. The extremely liver-like consistency is also worthy of some comment.

The species name here selected is chosen merely for euphony and is not particularly descriptive.

GENUS *PLACINOLOPHA* Topsent

Placinolopha mirabilis, new

Text Figure No. 172

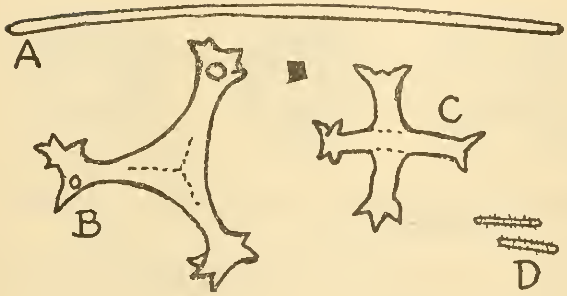
This species is here represented by the following:

U.S.N.M. No. 22939, My No. M. 309, here designated as type, collected June 20, 1949, by diver in the channel near Bikájela Islet at Ailing-lap-lap Atoll. The depth was 10 meters, and the substrate was dead coral.

This specimen is between massive and amorphous, about 4 cm thick and 4 cm in diameter.

In life the ectosome color was dull carmine red and the endosome ochre yellow. The consistency was between spongy and cartilaginous.

The surface is microtuberculate and is lipostomous, even the oscules being closed.



Text Figure No. 172. Spicules of *Plakinolopha mirabilis. A:* Strongyle, X 182. *B* and *C:* Modified calthrops, X 782. *D:* Microspined rods, X 782.

The ectosome is distinctive both as to structure and color. It is at least 100 μ thick and is crowded with spicules in confusion. The endosome contains some tracts of spicules. These tracts are about 100 μ in diameter and contain 30 to 50 spicules per cross section.

The skeleton comprises, first of all, long smooth strongyles 7 μ by 400 μ in dimensions. These crown the tracts and are scattered in the ectosome. A few also occur loose in the endosome. As megascleres, there are also fairly numerous spicules which might be called lophotetractines. These are small tetracts of the calthrops type, smooth except near the end, where a small number of very large spines occur. The rays of these spicules are about 25 μ by 80 μ. There are also microscleres which are straight spined rhabds, 2 μ thick and 12 μ long.

This species is so very distinctive that there are good grounds for arguing that a new genus should be erected for it. *Placinolopha* was established by Topsent 1897, page 429, for the species *bedoti.* This has oxeas up to 7 μ by 160 μ only, but the spicules with spiny ends are much larger than in *mirabilis.* Furthermore, many of these are not spiny on all four terminations but on only two or three of their terminations; and, in fact, there are triacts and tetracts present which are not spiny at all. There are none of the small microscleres. The second species in the genus *Placinolopha* is *spinosa* Kirkpatrick, 1900, page 350. This has no diactinal microscleres at all. Both *bedoti* and *spinosa* are from the East Indian region.

The name *mirabilis* is selected from a Latin word meaning "amazing."

FAMILY CHONDRILLIDAE Gray
GENUS *CHONDRILLA* Schmidt
Chondrilla australiensis Carter

Text Figure No. 173

This species is here represented by the following:

U.S.N.M. No. 22956, My No. M. 330, collected June 28, 1949, by diver near the north side of the lagoon near the old coast guard radio station at

Text Figure No. 173. Spicules of *Chondrilla australiensis,* X 782. *A:* Spheraster. *B:* Oxyeuaster.

Majuro Atoll. The depth was 3 meters, the substrate dead coral. This species was very common in this vicinity.

U.S.N.M. No. 22861, My No. M. 155, collected July 11, 1949, by diver at Likiep Atoll in the southeast portion of the lagoon near the church. The depth was 3 meters and the substrate was dead coral. This species was abundant throughout Likiep Atoll.

T. E. Bullock also collected this species in the summer of 1948, in the Eniwetok Atoll of the Marshall Islands. His Specimen No. Z. 9. This is a cake-shaped or semi-incrusting species, often as much as 7 mm thick and up to 7 cm in diameter.

In life the exterior color was black or nearly black but the endosome only drab. The consistency was very much like that of cartilage.

The surface is shiny smooth and is lipostomous.

The ectosome is a very thin, fleshy dermis, and the endosome is also densely fleshy. The flagellate chambers are small and round, about 20 μ to 35 μ in diameter.

The skeleton consists principally of mesogloea or jelly, which is more or less present in all sponges. In addition, there are two types of microsclere. One is a euaster, and the other is a spheraster. These are from 21 μ to 30 μ in diameter.

The species *Chondrilla australiensis* is sharply set off from others in the genus by its possession of both euasters and spherasters. It is common throughout the Australian region only and was described first by Carter, 1873, page 23.

Chondrilla nucula Schmidt

Text Figure No. 174

This species is here represented by the following:

U.S.N.M. No. 22846, My No. M. 140, collected July 5, 1949, by diver at Ebon Atoll from the Pearl Pool, which is near the west end of the lagoon. The depth was 1 meter, and the substrate dead coral. This species was found also in the miniature lagoon in the southwest corner of the Atoll. It was abundant throughout the whole lagoon.

Text Figure No. 174. Spicules (spherasters) of *Chondrilla nucula*, X 782.

U.S.N.M. No. 22858, My No. M. 152, collected July 7, 1949, from the open ocean west of Ebon Atoll near Rubé Point. The depth was 3 meters, and the substrate was dead coral.

This species is semi-incrusting, up to 1 cm thick and as much as 7 cm in diameter.

The color in life varied from slaty, almost black, to quite black, but the interior was only grayish drab. The consistency varied from cartilaginous to jelly-like.

The skeleton comprises only the mesogloea and microscleres. The latter are exclusively spherasters 20 μ to 32 μ in diameter.

This species was first described by Schmidt, 1862, page 39, from the Mediterranean. It is also very common throughout the West Indian region. There is one record from the Australian region by Burton, 1924, page 206.

Chondrilla acanthastra, new

Text Figure No. 175

This species is here represented by the following:

U.S.N.M. No. 22916, My No. M. 221, here designated as type, collected September 1, 1949, by divers in Iwayama Bay near Koror in the Palaus. The depth was 2 meters, and the substrate was dead coral.

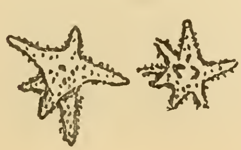
This species is incrusting, about 1 mm thick and upwards of 15 cm in lateral dimensions.

The ectosome and endosome color in life was grayish drab, and the consistency was between that of jelly and cartilage.

The surface was shiny smooth and lipostomous.

The ectosome consists of an exceedingly thin fleshy dermis, and the endosome is also very jelly-like or fleshy.

The only skeleton, other than the ubiquitous mesogloea, consists of very distinctive microscleres. These are euasters but not oxyasters; instead, they are chiasters with blunt terminations. Furthermore, the rays are conspicuously and entirely spiny. The diameter varies from 17 μ to 22 μ.



Text Figure No. 175. Spicules (microspined euasters) of *Chondrilla acanthastra*, X 782.

This species *acanthastra* is peculiar for the spiny rayed asters. In fact, the only other species having exclusively euasters is the following one from the island of Yap.

The species name selected comes from the Greek word for "spiny" and "star," and is descriptive of the spicules.

Chondrilla euastra de Laubenfels

Text Figure No. 176

This species is not represented by any specimen in the present collection. It was collected in July 1946, by R. W. Hiatt, from the Island of Yap, which lies north of the Palaus. The type specimen is U.S.N.M. No. 22731.

It is a smoothly rounded mass, 7 by 10 by 14 mm.

Text Figure No. 176. Spicules (oxyeu-asters) of *Chondrilla euastra,* X 782.

In life the color was black on the exterior and dark gray in the interior, and the consistency between that of a stiff jelly and cartilage.

The surface was smooth. The pores cannot be made out, but oscules are present, about 200 μ in diameter and 3 to 5 mm apart.

The ectosome is a fleshy dermis, containing amoeboid cells, and is about 100 μ thick. The endosome is dense and jelly-like, with the usual structure of canals and chambers.

The skeleton comprises, in addition to the jelly, scattered euasters 18 μ in diameter with smooth, sharp-pointed rays.

The species was described by de Laubenfels, 1949, page 125.

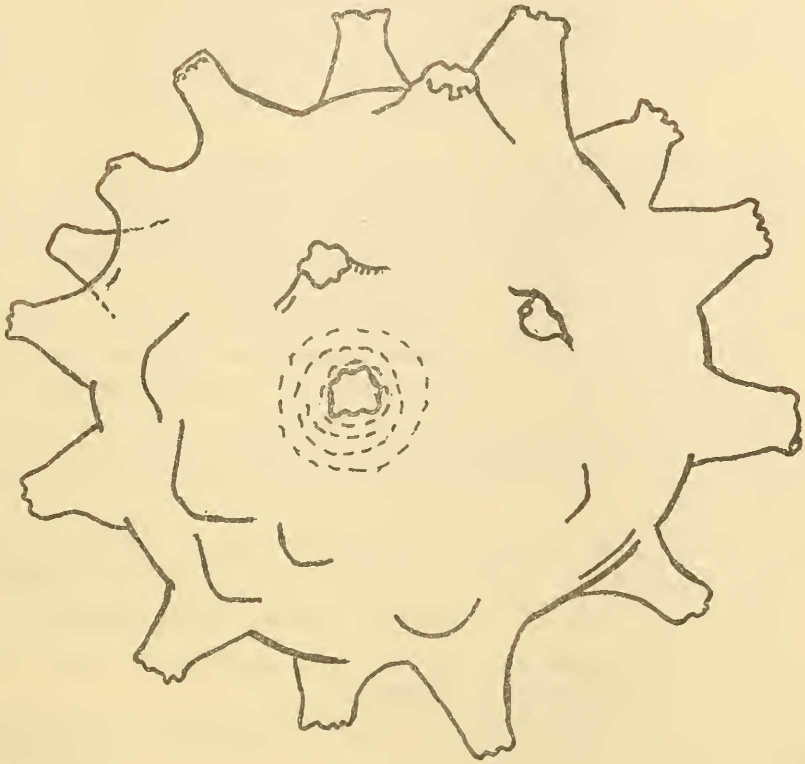
Chondrilla grandistellata Thiele

Text Figure No. 177

This species is here represented by the following:

U.S.N.M. No. 23002, My No. M. 381, collected July 11, 1949, by diver in the southeast corner of the lagoon near the church at Likiep Atoll. The depth was 3 meters, and the substrate was dead coral.

This species was exceedingly abundant in Likiep Atoll; and, although occurring in close juxtaposition to *Chondrilla australiensis* (often specimens on the same piece of coral), the two showed no intermediates and could be discriminated in the field as well as under the microscope by the difference in color.



Text Figure No. 177. Spicule (spheraster) of *Chondrilla grandistellata,* X 782.

This species is cake-shaped, 2 cm in thickness and 10 cm in diameter for typical size.

The exterior color in life was drab and was especially pale around the oscules which, being dark, were conspicuous. The endosome was also pale drab. The consistency was cartilaginous.

The surface is shiny smooth, and the pores could not be made out. The oscules are conspicuous as dark spots, even when closed, and are about 2 cm apart, probably as much as 1 mm in diameter when fully opened.

The ectosome is packed with large spicules and is about 200 μ thick. The endosome is cartilaginous and contains a much smaller number of the spicules.

The skeleton comprises, in addition to the usual cartilaginous jelly, enormous spherasters, 130 μ in diameter, with very blunt terminations to the rays. These terminations are distally spined.

This very distinctive species was first described by Thiele, 1900, page 65, from the East Indies, for which region of the world it appears to be distinctive.

FAMILY CHONDROSIIADAE Schulze
GENUS *CHONDROSIA* Nardo
Chondrosia chucalla de Laubenfels

Text Figure No. 178

This species is here represented by the following:

U.S.N.M. No. 22829, My No. M. 104, collected June 11, 1949, by hand while wading in the south part of the lagoon near Bikájela Islet at Ailing-lap-lap Atoll. The depth was just below low tide and the substrate was dead coral. This species was abundant in this vicinity.

U.S.N.M. No. 22942, My No. M. 312, collected June 20, 1949, by diver at Ailing-lap-lap Atoll in the channel between the ocean and the lagoon, east of Bikájela Islet. The depth was 10 meters, and the substrate was dead coral.

U.S.N.M. No. 22943, My No. M. 313, collected June 20, 1949, at the same locality as that of the preceding specimen, but the substrate was another living sponge.

U.S.N.M. No. 22813, My No. N. 019, collected April 25, 1946, by J. P. E. Morrison at Bikini Atoll 500 meters west of the southeast point of Bikini Islet. The depth was 6 meters. This is a dubious specimen.

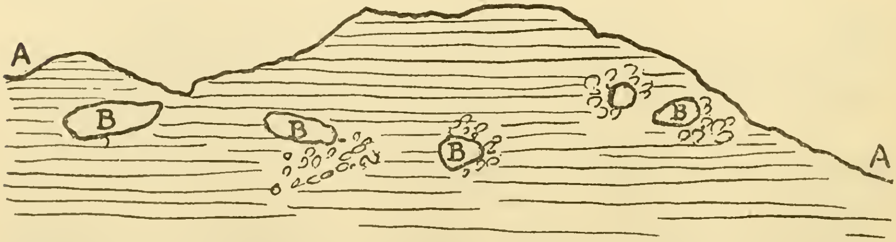
Chondrosia chuchalla is a semi-incrusting species, being about 4 mm thick and meandering indefinitely laterally.

The color in life was black on the exterior and slaty drab in the interior. The consistency was cartilaginous.

The surface is smooth and lipostomous.

The ectosome is fleshy, about 100 μ thick, and the interior very cartilaginous and dense.

This species, like all of the genus, has apparently no spicules or mineral skeleton but only the mesogloea or jelly. A warning may be offered that if a large enough number of specimens are macerated, a few spicules might be found.



Text Figure No. 178. Section of *Chondrosia chucalla,* perpendicular to the surface, X 182. *A:* Surface. *B:* Sections of canals. A few of the cells are indicated.

This species was first described as *Chondrosia collectrix* by Lendenfeld, 1888, page 74, from Australia. It occurs also in Hawaii. Because there was already a pre-existing species, *Chondrosia collectrix* of Schmidt, de Laubenfels, 1936, page 184, set up for this the species name *chucalla.*

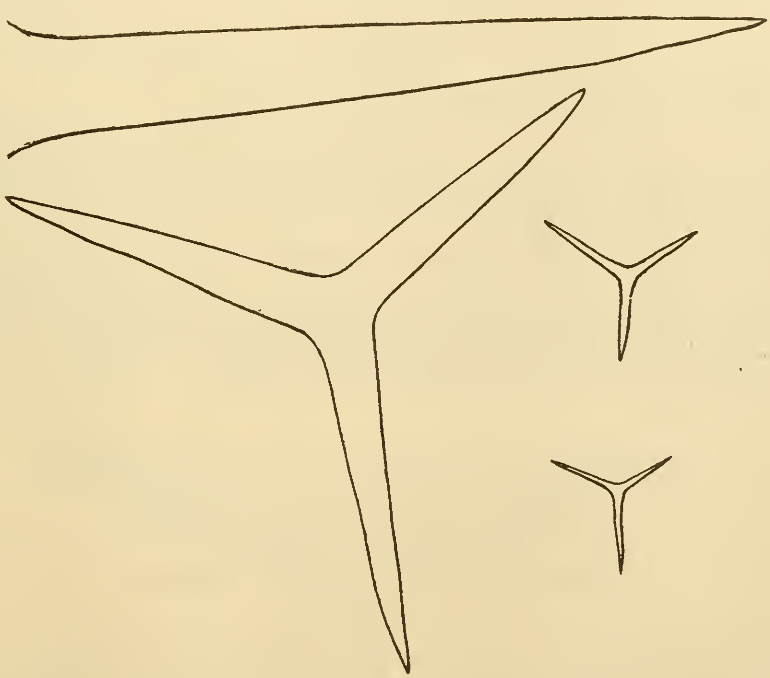
CLASS CALCISPONGEA Schmidt
ORDER ASCONOSA de Laubenfels (or ASCONIDA*)
FAMILY LEUCETTIDAE de Laubenfels
GENUS *LEUCETTA* Haeckel
Leucetta primigenia Haeckel

Text Figure No. 179

This species is here represented by the following:

U.S.N.M. No. 23066, My No. M. 446, collected August 3, 1949, by diver in southwest Ponapé (Kiti) from a reef in the lagoon. The depth was 3 meters, and the substrate was dead coral.

This is an irregular mass, 1 to 2 cm thick and 3 by 7 cm in lateral dimensions.



Text Figure No. 179. Spicules (triacts) of *Leucetta primigenia,* X 182. Only a single ray is shown (at the top of the drawing) of one of the largest triaxons.

* See footnote on page 4.

The color of the ectosome in life was dull, whitish to reddish brown, and the endosome had the same dark color. The consistency was stiffly spongy, crisp.

The surface is smooth and has pores, 20 μ to 30 μ in diameter and 70 μ to 150 μ apart, but the oscules, amazingly, cannot be found.

The ectosome is very thin and inconspicuous. The endosome is very much like that of the Demospongea, as is true of the genus *Leucetta* in general. The flagellate chambers are numerous, and 50 μ to 100 μ in diameter.

The skeleton consists almost entirely of triaxons of tremendous variation in size, and (as is often true in the genus *Leucetta*) it appears that there are two categories of triaxon—a larger and a smaller. The larger category has rays from about 100 μ by 900 μ to perhaps as much as 140 μ by 1200 μ. The spicules in the smaller size range are also regular triaxons, with rays varying from 9 μ by 85 μ to 12 μ by 110 μ.

This species was described by Haeckel, 1872, page 118, from the vicinity of Africa, also the Indian Ocean, and Australia.

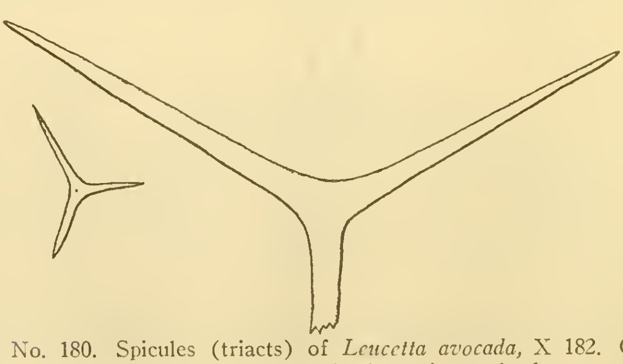
Leucetta avocada, new

Text Figure No. 180
Plate XII, Figure b

This species is here represented by the following:

U.S.N.M. No. 23091, My No. M. 473, here designated as type, collected August 17, 1949, by diver in the northeast corner of the lagoon in the lee of Givry Islet at Kuop Atoll. The depth was 2 meters, and the substrate was dead coral.

U.S.N.M. No. 23118, My No. M. 500, collected September 2, 1949, by diver in Komebail Lagoon northwest of Koror in the Palaus. The depth was 5 meters, and the substrate was dead coral. This species was fairly abundant in Kuop Atoll and also in the Palau region.



Text Figure No. 180. Spicules (triacts) of *Leucetta avocada,* X 182. Of the larger triaxon, one of the arms is shown incompletely.

The shape of the individual sponge of this species may be considered to be a cone 12 cm high, rising from a base 12 cm in diameter to an apical oscule 4 cm in diameter, with a smooth sharp rim. It is frequently true, however (as in the type specimen), that two or more individuals of this type grow so close together that their bases coalesce. It is strikingly characteristic of the species that the sides of these cones are deeply furrowed, with furrows about 1 cm apart and nearly 1 cm deep but rounded in contours.

The exterior color in life was dark green, sometimes verging on olive. The interior was regularly lighter and brighter—a very vivid green. The consistency was crisp, stiff, and easily cut.

Other than the above-mentioned deep furrows, the surface is almost smooth. The pores are on the outside of the sponge and are 30 μ to 60 μ in diameter, not uniformly spaced but occurring often in little groups of two or three almost touching one another. These groups are frequently as much as 100 μ to 200 μ apart. They extend over the whole exterior surface. The interior cavity or cloaca extends from the summit almost down to the base of the sponge. The openings into it may possibly be the genuine oscules. These are 1 to 2 mm in diameter and 3 to 5 mm apart.

The ectosome is a very thin, fleshy structure but is underlain by numerous small spicules. The endosome is rather like the crumb-of-bread structure found in many Demospongea and is crowded with globular flagellate chambers about 90 μ in diameter. There are conspicuous inhalant canals (prosochetes), perpendicular to the exterior surface, and there are also conspicuous exhalant canals (apochetes), perpendicular to the cloaca.

The skeleton comprises only triaxons of two size ranges with very long sharp rays. Of the larger spicules, these are 20 μ by 300 μ, sometimes as much as 35 μ by 400 μ. Of the smaller size range, there are some 5 μ by 75 μ to 10 μ by 100 μ.

For a *Leucetta* having only triaxons, no oxeas or tetraxons, the long thin rays are somewhat distinctive. The color scheme is also noteworthy, and particular attention is called to the vertical, very deep, very conspicuous surface furrows.

ORDER SYCONOSA de Laubenfels (or SYCONIDA*)

FAMILY LEUCONIIDAE de Laubenfels

GENUS *LEUCONIA* Grant

Leuconia tropica (Tanita) de Laubenfels

Text Figure No. 181

This species is not represented by any specimen in the present collection. It was collected in the Palaus (with no further details given), by a Mr. Hiro in 1936 and by a Dr. Abe in 1935.

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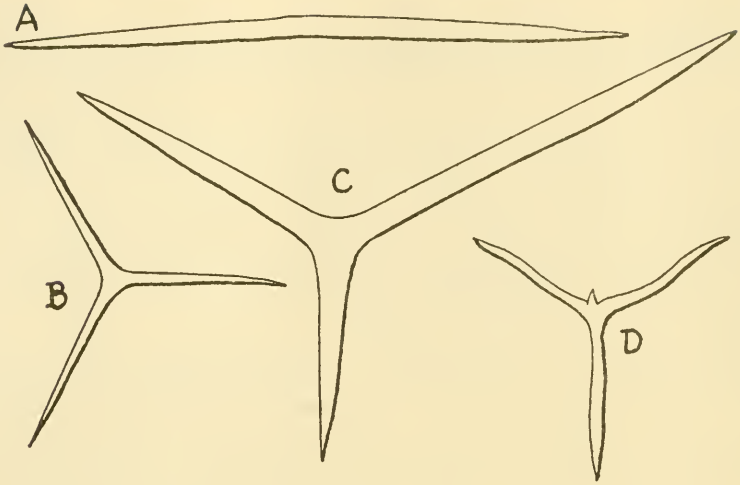
* See footnote on page 4.



Text Figure No. 181. Spicules of *Leuconia tropica,* X 90, after Tanita. *A:* Oxea. *B:* Ectosomal triact. *C:* Tubar triact. *D:* Tetract, in this case from the wall of one of the larger exhalant canals.

The shape is subspherical, with a large central cloaca, and the size is about 2 cm in diameter.

The color in preservation is yellowish white, and the consistency brittle and rigid.

The surface is hispid, and the size of pores is not given; but the oscules (or at least the upper opening of the cloaca) may be as much as 12 mm in diameter.

The dermal structures are very thin, and the endosome exhibits a typical rhagon architecture, with flagellate chambers as much as 100 μ to 145 μ in diameter. The skeleton comprises dermal triacts tangentally placed, and tetracts with three rays tangental and the fourth piercing down into the chamber layer. The rays are about 16 μ by 300 μ. In the chamber layer there are large triaxons with rays about 50 μ by 300 μ in dimensions. Lining the cloaca, there are small tangentally placed triaxons and also tetraxons—some of which have a small ray penetrating into the cavity, others of which have a longer ray penetrating back into the chamber layer. Many of the rays are about 12 μ by 400 μ.

This species was described by Senji Tanita, 1943, page 434. He states "the main characteristic of this species is the presence of dermal quadriradiates with apical rays protruding not very deeply into the chamber layer. In this point the present species bears a close resemblance to *Leucandra thulakomorpha* Row and Hozawa, 1931, page 791; but it differs from the latter in the presence of subgastral radiates, and the larger size of tubae

triradiates." Tanita used the genus *Leucandra,* which falls in synonymy to *Leuconia.* I was unable to find any similar sponges in my extensive survey of the Palau region, but it may be that Tanita and his assistants had access to other regions than those which I visited in the summer of 1949.

Leuconia palaoensis (Tanita) de Laubenfels

Text Figure No. 182

This species is not represented by any specimen in the present collection. It is recorded only by Senji Tanita, and there was no collection data other than "from Palau in the Caroline Islands." It would be most interesting to know the precise ecological placement of these *Leuconias.*

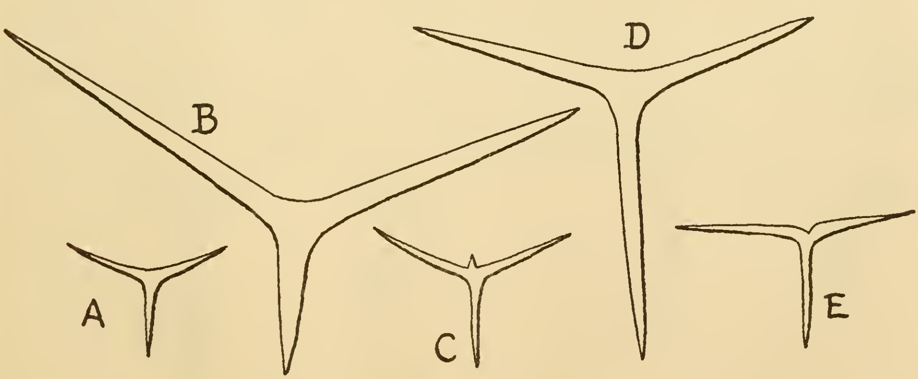
This species is described as being a branching colony, the individuals a little over 1 cm in diameter and a little over 2 cm high.

The color in alcohol is described as rusty yellow and the consistency as firm.

The surface is smooth, the pores not described, but the oscules are said to be about 2 by 4 mm.

The ectosome is very thin, and the endosome exhibits a typical rhagon structure with flagellate chambers, 80 μ to 130 μ in dimensions.

The skeleton comprises a number of triaxon and tetraxon spicules. Those which are tangental to the interior surface have rays about 30 μ by 380 μ. The ones of the chamber layer, called tubar triradiates by Tanita, have remarkably large rays, 80 μ by 400 μ. There are sagittal triradiates, with their clads in the lining of the cloaca and their rhabd perpendicular to the cloaca, piercing the chamber layer. These have rays about 40 μ by 500 μ. The spicules which lie tangental to the cloacal surface are triaxons with rays 17 μ by 240 μ



Text Figure No. 182. Spicules of *Leuconia palaoensis,* X 60, after Tanita. *A:* Cloacal triact. *B:* Tubar triact. *C:* Cloacal tetract. *D:* Subcloacal triact. *E:* Triact from the oscular margin.

or similar tetraxons, with a fourth very small ray projecting into the lumen of the cloaca.

Tanita comments that this is "remarkable for the presence of well-developed sub-gastral triradiates and of large tubar triradiates." This was described by Tanita, 1943, page 454, as *Leucandra palaoensis.*

FAMILY SCYPHIDAE de Laubenfels

GENUS *SCYPHA* Gray

Scypha plumosa (Tanita) de Laubenfels

Text Figure No. 183

This species is not represented by any specimen in the present collection but was found in the Palau Archipelago. There is no data as to the ecological or geographical placement. Some specimens were collected by Mr. Hiro and some by Dr. Abe, as quoted by Tanita.

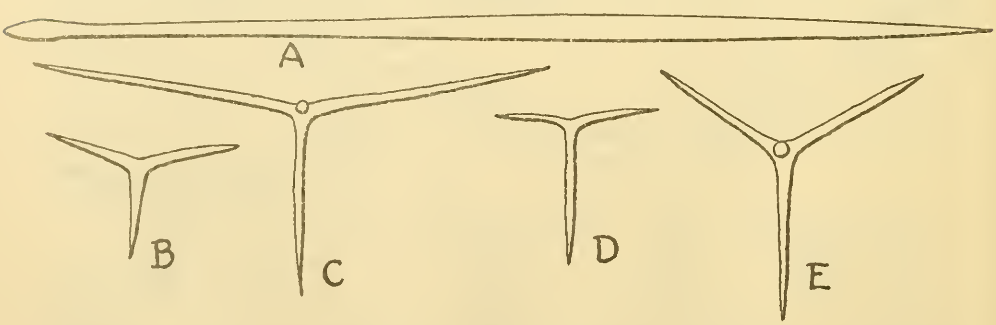
This is a tubular sponge, ranging up to 3 cm and 2 cm in diameter.

The color is described as being white, and the consistency as fragile.

The surface is strongly hispid. The pores are not described, and the oscules range up to 5 mm in diameter. There is one such oscule or upper opening of cloaca to each individual.

There is only a thin dermal structure, and the endosome exhibits typical sycon architecture.

The skeleton of this species includes three types of oxeas. A common kind, perpendicular to the surface, is about 32 μ by 2400 μ. Amazingly there are others, also hispidating the surface, only 3 μ thick by about 4800 μ long. Around the cloacal opening there are coronal oxeas, 8 μ by 2400 μ. The dermal triaxons have rays which are about 16 μ by 200 μ. They are sagittal, with the clads tangent to the surface, and the rhabds protruding. The triaxons of the chamber layer are also sagittal, their rays being about 18 μ by 300 μ. The clads are nearer the cloaca, rhabds point toward the exterior. Other



Text Figure No. 183. Spicules of *Scypha plumosa,* X 90, after Tanita. *A:* Tylostyle, from distal end of flagellate chambers. *B:* Tubar triact from distal end of flagellate chambers. *C:* Tetract from oscular margin. *D:* Subcloacal triact. *E:* Cloacal tetract.

sagittal triradiates have their clads in the cloacal lining, their rhabds in the chamber layer. The clads are 7 μ by 150 μ and the rhabds are 9 μ by 300 μ. There are tetraxons, with clads about 14 μ by 200 μ tangentally placed in the cloacal lining, and rhabds of similar size protruding into the lumen.

This species was described as *Sycon plumosum* by Tanita, 1943, page 404. He compares its shape to that of *Scypha ramsayi* (Lendenfeld) and its spicules to those of *Scypha australis* (Jenkin).

Ecological Discussion

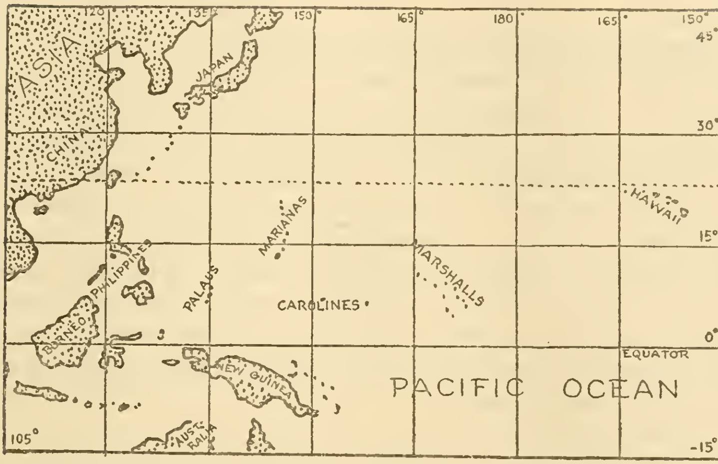
The geography and geology of the four archipelagos covered in the present discussion may be briefly described as follows:

The islands of the Mariana group are all close to the 145th meridian of east longitude and extend from about 13° to 21° north latitude. They are extremely likely to suffer from hurricane or typhoon damage, and they have unpleasant, hot, humid climates. There are abundant evidences of their volcanic origin, but they are much older than the Hawaiian Islands whose volcanos still show plainly. On the other hand, they are younger than the more southerly atolls. Actually much of the land of the Marianas is elevated table reef or reefs. Well-marked terraces indicate several separate uplifts. A good discussion of table reefs may be found in their description by Tayama, 1935. He says that they are built up largely by such corals as *Porites, Favia, Acropora,* and *Leptoria,* and (when living) come to have a nearly level surface just below the ocean surface. There may be slightly raised rims of coralline algae about them.

There are fringing reefs in the Marianas, but only narrow lagoons are to be found. For much of the shore line, the waves of the open ocean break directly on the beach. The lagoons, when present, are usually shallow, and often one may wade to the outer edge. Such a whole structure may be regarded as a table reef more recent than the reefs which have been elevated to form the land mass. Tayama's 1939 account refers to them as "apron reefs." Lagoons as wide as one to three kilometers and as deep as 5 meters are found in northwest Saipan (Tanapag Harbor) and extreme southern Guam (Merizo Bay). It was my observation that the bottom of these lagoons was chiefly debris of dead coral, but here and there were little island clumps of living coral. In these lagoons the water temperatures are often very high.

The islands of the Palau or Peleu group lie at about 134° to 135° east longitude and 7° to 8° north latitude. They have a pleasant tropical climate. Part of their elevated structure is residue of extinct volcanoes, part is elevated marine deposit—now limestone. The largest island, Babeldaub, has an area of 370 square kilometers and may be called a plateau. The limestone is often cemented coral with interstices filled by foraminiferal sand. There are beds of lignite and clay; Pliocene fossils are fairly common. Some fossils as ancient as the Eocene are recorded (Tayama, 1939). It seems possible to correlate some of the terraces with those in the Marianas.

In addition to the ancient, elevated reefs, there are contemporary living ones, in two series. One line of reefs is very near the shore, seldom more than a kilometer from it, and thus a very shallow lagoon is inclosed. Where the shore is volcanic rock, mangrove thickets are conspicuous. Where the shore is limestone, there are no mangroves at all, but instead, the immediate shore is often steep and undercut. Evidently the extreme surface of the



Text Figure No. 184, Map number 1. West central Pacific Ocean, showing the archipelagos studied in this treatise.

water (but not the deeper portion) dissolves the limestone. This is probably the result of rain water, which for a while floats on top of sea water. In other places the limestone shore is flanked by sandy beach, perhaps an older stage in the sequence.

The outer reefs contain an area more than 100 kilometers north and south and more than 25 kilometers east to west. Within this area are four large islands (Anjaur, Peleu, Koror, and Babeldaub) and hundreds of little ones. This lagoon is often as much as 30 meters deep. It is much wider west of the islands than it is east of them.

The Palaus, together with Yap and some scattered smaller islands, are often called the Western Carolines. In this case, those islands next to be discussed are called, in contrast, the Eastern Carolines. It is 1,500 kilometers from Yap to Truk.

The Caroline Islands (or Eastern Carolines) have no submerged table reefs as in the Marianas and Palaus. Terraces are absent or at least poorly defined; but drowned valleys are well developed, as they are not in the Palaus and Marianas. The reefs are living and form barrier reefs in almost the shape of atolls. The climate is pleasantly tropical, with much rain, especially in Ponapé. My studies were chiefly in Truk and Ponapé, plus one day at the very interesting uninhabited atoll called Kuop. It is interesting to note that certain of the smaller units of the Carolines have become complete atolls.

Truk is an atoll, or almost an atoll, consisting of a roughly circular outer reef about 60 kilometers in diameter and a number of large volcanic islands in the lagoon. Some of these, such as Moen and Tol (places where I studied sponges), are about 5 or 6 kilometers in diameter. I was not able to get out

to the fringing reef to study its sponge fauna. Truk lies between 7° and 8° north latitude, between 151° and 152° east longitude.

Kuop Atoll, a short distance south of Truk, is as typical an atoll as are most of those in the Marshall Islands. I found it very interesting to study.

Ponapé has not sunk so deeply as Truk, and it follows that much of the area of the valleys between the volcanic peaks is still above sea level. There are drowned valleys, however. The lagoon around Ponapé is, of course, much narrower than that about Truk, usually only 1 to 5 kilometers wide. The main land mass is about 20 kilometers in diameter. Because of its heavy rainfall and proportionately large land area, the Ponapé Lagoon must have exceptionally rich content of whatever organic and inorganic material may be dissolved out or washed down from the land. Ponapé is about 7° north latitude and a little more than 158° east longitude.

The Marshall Islands, exclusive of Eniwetok (162° 30′ east) lie between 165° and 175° east longitude, and from nearly 5° to about 12° north latitude. No volcanic rock occurs naturally in any. (This is to say that, if each was originally a volcanic cone with a fringing reef, the cone has sunk clear out of sight and only the living, growing reef remains.) The Japanese geologist, Risaburo Tayama, who studied this region carefully, writes (1935) that the coral reefs are distributed with such lack of uniformity in the Marshalls, Carolines, Palaus, and Marianas that he is reluctant to accept Daly's glacial control theory. He prefers the venerable subsidence theory of Darwin. I find Tayama convincing in this regard.

The Marshalls include a few small isolated islands, such as Mejit. Perhaps these had volcanic bases which never more than barely reached the surface. Typically, however, the unit in the Marshalls is a large atoll. There is a lagoon upwards of 25 kilometers in diameter, surrounded by a rim of reef and islets. In a few cases, notably Namorik, no deep channel pierces the ring, but usually there are one or a few deep channels through which ships may enter the lagoon. The rim is usually less than half islet, more than half reef. The islets are often as little as 100 to 300 meters wide but may be several kilometers long. The reef which connects the islets, like the string on which a necklace of beads is strung, is often so near the surface that at low tide one could wade from one islet to the next.

The deeper portions of these reefs are probably chiefly calcium carbonate in a variety of conditions varying from solid limestone to colloid. On the outer side, the wall is perpendicular or even overhanging, especially on the southwest or lee side. At a depth of 50 meters or so, however, a slope curves outward and at great depths becomes more and more gentle. On the inner side the reef yields to a gradual slope until in the lagoon a depth of 20 to 40 meters may be reached. Occasional small islands of live coral rise nearly to the surface of the lagoon, but most of its bottom is covered with dead calcareous debris, foraminiferal sand, fragments of coralline algae, and bits of

anthozoan skeleton ranging in size all the way from minute bits up to slabs as large as table tops. The crest of the reef also consists quite extensively of the same sort of dead material—sometimes loose pieces akin to gravel, or shingle, or fragments small enough to be called sand. Again a cementing process has made a sort of coquina or calcareous sandstone.

Three sorts of openings exist for transfer of water into and out of the lagoon. First, there may be one or a very few wide, deep openings, perhaps 100 meters wide and 30 deep, through which the tidal currents run at 2 to (rarely) 4 kilometers per hour. It will be noted that such channels are richly lined with live coral and other sessile life. Second, there may be one or a few similar but smaller channels, say 20 meters wide and 10 meters deep. The tidal currents in these are often more than 5 kilometers per hour. The sides and bottoms of them are scoured fairly clean of life. Third, there are usually dozens of smaller channels over the reef, often so shallow that they are dry at low tide. At half tide, the currents in these are quite violent. They, too, are devoid of all conspicuous forms of sessile life.

On the Marshallese atolls, near the southwest side of the lagoon (the prevailing winds being from the northeast), there is a small, often somewhat incomplete reef 100 to 300 meters off shore, enclosing a miniature lagoon within the greater lagoon.

Among the principal algae which construct the reefs are *Halimeda* and *Lithothamnion.* In places algae actually do more to build up the reef than do coelenterate corals. My own observation, however, was to the effect that Anthozoa were more conspicuous participants in the life of the reefs. In some areas "staghorn" corals, probably of the genus *Acropora,* form dense thickets.

A comprehensive report on the madrepore and millepore corals of the Western Pacific may soon be published by Dr. John W. Wells. Probably such reef-building genera as *Stylophora, Orbicella, Porites,* and *Pocillopora* may be reported.

It will be necessary to speak of sponge abundance in generalized terms, because methods which might yield precise returns for other animals are inappropriate for the Porifera.

Considering the numbers of individuals is valuable as a factor but meaningless alone. There are areas with hundreds of specimens of *Spirastrella,* but each just a fingernail-sized fleck, and such an area is best described as poor in sponges.

The same applies for the size of individuals. In a whole bay there may be many kilograms of sponge, but all aggregated in the form of one or two huge specimens of *Stellettinopsis.* This is not abundance of Porifera. And how shall one measure sponge quantity? A freshly removed specimen is mostly water, which does not readily drain out of the complex system of canals and chambers. The bulk of the dry weight of many sponges is dead skeleton—silica or calcium carbonate or spongin.

Graphs or curves are very impressive but would be misleading if forcibly applied to sponge abundance. Nevertheless, it is possible to use such words as *rare, uncommon, common,* and *abundant.*

The term *abundant* may be used when nearly every square meter has a sponge or sponges whose gross size would approximate that of a human fist. Such areas are frequently found throughout the West Indian region and Mediterranean. The only places in the world that I know of where they reach a greater abundance are in the Bermudas as, for example, at Walsingham Pond. In that place they may fairly be called superabundant.

The term *common* may be used when nearly every four square meters contains a sponge, and in 25 square meters a double handful could be found. Such areas are world wide. Probably half of the rocky coasts on earth have such an abundance just below low tide.

The term *uncommon* may be used when there is only about one easily found sponge for each hundred square meters.

The term *rare* may be used when one must hunt for hundreds of meters to find even one sponge.

In discussing the abundance of separate species, a more liberal allowance is taken. If a single species is represented in each hundred square meters, it is a decidedly abundant one. If in any search of one hour at least one specimen can be found, that species is common. Uncommon species are represented by 5 to 15 specimens altogether, and rare species by only one or two specimens.

The requirements of sponges for physical and chemical factors are only moderately well known. Pertinent data are given in such literature references as the following, which are here cited with comments.

Sponges require protection from burial or smothering. Thus, they require clean water and suitable attachment.

McDougall, 1943
Parker, 1910
Verrill, 1873
de Laubenfels, 1947
de Laubenfels, 1950
Vosmaer, 1882

Sponges require moving water but not excessive current. Often 2 to 3 kilometers per hour seems ideal. This may have particular significance for the initial attachment of sponge larvae. Oxygen needs are also certainly involved.

Jewell, 1935
Bidder, 1896, 1923
McDougall, 1943
Hyatt, 1877
Rathbun, 1887
de Laubenfels, 1947, 1950

Sponges require proper osmotic pressure, which is usually that of full oceanic salinity. Only exceptions are a few genera, which are tolerant of fresh or brackish water. Sponges, as a rule, cannot endure more than a fraction of a per cent of excess salinity.

Annandale, 1914 ("Chilka")
Galtsoff, 1925
de Laubenfels, 1947
de Laubenfels, 1950

Sponges require the various ions which are normally present in sea water, perhaps thrive in ratio to the abundance of some, such as phosphate and silica.

Jorgensen, 1944
Galtsoff, 1925
de Laubenfels, 1932
de Laubenfels, 1950

Sponges thrive at all temperatures normally present, but each species has narrow limits and dies if temperatures become colder or warmer than those which are normal to its selected environment.

Jewell, 1935
Arndt, 1937
McDougall, 1943
Orton, 1920
de Laubenfels, 1932

Sponges have certain limits of bathymetric tolerance for each species, probably correlated with both temperature and oxygen, although one species or another is adapted to practically every oceanic depth.

Arndt, 1943
Bassindale, 1943
Minchin, 1900
de Laubenfels, 1936 (paleo)
Burton, 1928
Chumley, 1918
Stephenson & Stephenson, 1948

Sponges frequently contain symbionts; individual species may well depend upon such symbionts for nourishment. The requirements for light are very significant for such species, but utterly insignificant for other sponges.

van Tright, 1919
van Weel, 1949
de Laubenfels, 1932, 1947
Dendy, 1926
Weber & Weber, 1890
Pearse, 1932

Sponges react upon neighboring sponges, often adversely. This may have survival value in obtaining suitable space from other (competing) sponges.

de Laubenfels, 1928, 1932

Sponges may be displaced by other animals, but this appears rare. Data in the present article may be the first of this sort.

Sponges are attacked by a few predators, such as angel fish and sea turtles.

de Laubenfels, 1932, 1947, 1950

Sponges suffer from numerous internal parasites and even from disease epidemics.

Dosse, 1939
Galtsoff, 1940
de Laubenfels, 1947, 1950

Sponges attach to and damage or smother other animals.

Annandale, 1914, 1915
Churchill, 1920
Old, 1941
Volz, 1939

The first item for ecological consideration is the amazing paucity of sponges in the Marianas. Only guesses can here be made as to the reasons. The surmise that seems most plausible to me is that the great hurricanes or typhoons which periodically ravage this archipelago may be responsible for the lack of sponges.

As for Saipan, a preliminary survey was made from the incoming airplane and from maps, and all the likely places noted. On much of the coast line the surf breaks on the main body of land, and the shore drops quickly to a depth of 10 meters or more. This terrain is unfavorable to sponges, especially to any larger than postage-stamp-size incrustations. It is difficult to study because of waves and dangerous because of sharks. Where I did observe such areas with the viewing box, absolutely no sponges could be seen. The likely places were the lagoons within reefs. These were chiefly on the west or lee side of Saipan.

Using two divers in the water and a viewing box, we spent several hours combing a lagoon area from reef to shore (a few hundred meters) for a long-shore distance of about 4 kilometers without finding a single sponge or even an incrustation as small as a finger nail. Finally, in one area of less than an acre, we found a few score specimens of two species. This area was peculiar in that it was sheltered by high cliffs from all directions except the west.

In Tanapag harbor, with deeper water, several hours search was conducted using the usual technique. Two divers were in the water. Large sponges were found; but only about one per acre, and these exclusively of one species *(Stylotella agminata)*. This is an outstandingly hardy sponge.

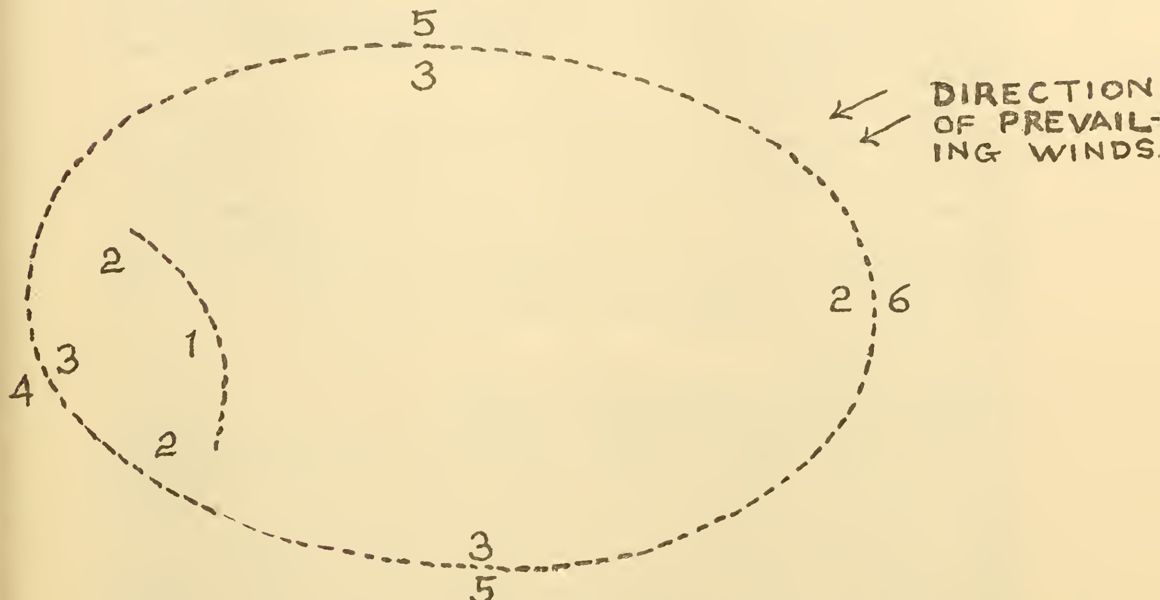
Saipan has fewer sponges than any area of comparable size and solidity in the world that I know of.

Guam presented a picture of sponge rarity exceeded only by Saipan. One day I spent several hours wading in shallow lagoon waters using the viewing box and overturning stones and could not find even the most minute trace of a sponge. Later, with the assistance of divers, we finally found nine species, chiefly in a deeper lagoon, between a smaller island and the main land mass (that is, in an area of exceptionally great protection from storm waves). This area covered about 20 acres of water. In the autumn of 1949, only about two months after my field work, a violent typhoon again swept Guam. Mr. A. B. Bronson (who helped me collect), in answer to my inquiries, said that the area where we found the most sponges was amazingly little disturbed by the hurricane. Flimsy buildings on the shore at that point were undamaged; trees near there were not mutilated. There are good indications that the topography of hills, shore line, and wave action render that particular locality peculiarly free from storm violence.

In apparent refutation of my hypothesis as to storm damage, it must be observed that in portions of the West Indies which are subject to violent hurricanes, sponges do thrive. An hypothesis may be advanced to explain this discrepancy. It may be that the West Indian hurricane does ruin many sponges in its immediate path, but subsequently others migrate in from the abundant shallow water areas on each side which are not so devastated. The Marianas are surrounded by great stretches of deep ocean so that their recolonization must be slow and difficult.

The Palaus, Carolines and Marshalls are not immune from hurricanes, but suffer much less typhoon damage over a long period than is true of the Marianas.

In all three of these archipelagos, observation of relative sponge abundance showed a consistent relationship to exposure. A conventionalized diagram of an atoll may be used to illustrate the comparative suitability of locations as follows:



Text Figure No. 185. Diagram of relative sponge abundance in a generalized atoll. 1: Greatest abundance. 6: Least abundance.

The numbers represent six degrees of sponge abundance, number one being the maximum and number six the minimum.

McDougall (1945) and I (de Laubenfels, 1947) have shown that water currents are vital to sponge success. In general, from zero up to a point somewhere between 2 and 3 kilometers per hour of usual current speed, the faster the motion the more the sponges prosper. The most cursory observation, however, shows that water movement is often above 2 kilometers per hour in the area here studied. The equatorial and counter equatorial ocean currents (see de Laubenfels, 1950) produce widespread streams in the open ocean about the Marshall Islands, which movement is consistently near or even over 2 kilometers per hour.

The violent or destructive motion probably responsible for relative showings in Figure 185, is due to wind action and especially to wave action.

The relative abundances shown by the six numbers pertain only to depths of less than 10 meters, chiefly less than 5 meters. In such shallow water wave action is effective.

It will be observed that the maximum abundance, as shown by the number *1*, is in the twice sheltered locality to the lee of the miniature reef within the larger lagoon. This situation was brought out in my field collecting conspicuously at Ailing-lap-lap and Ebon Atolls and not so definitely at Majuro Atoll. I did not find exactly such a place anywhere in Likiep Atoll; but this is not significant, because I was unable to explore carefully the western part of Likiep Atoll.

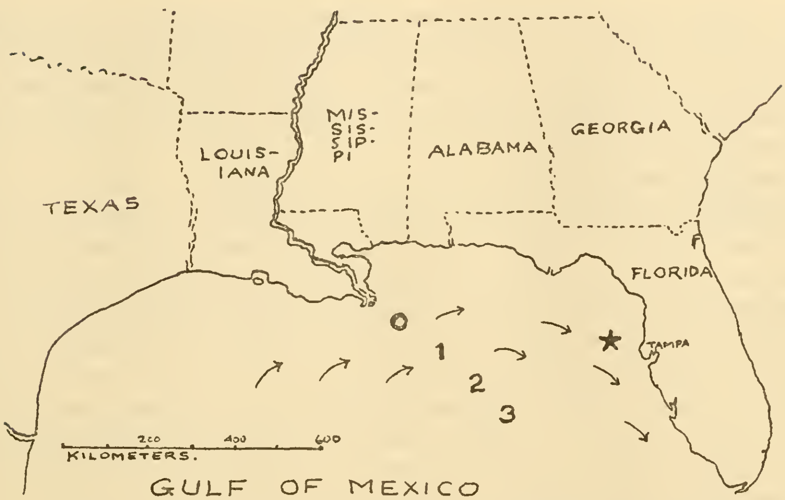
Ponapé presents a very interesting layout in terms of the ecological situation now under consideration. The lagoon surrounds the entire island with only relatively insignificant exceptions. Yet this lagoon is everywhere so narrow that wave action cannot build up to great activity within its confines. To use the scale of abundances from *1* (maximum) down to *6* (minimum) for Ponapé would merely involve placing the figure *1* in practically every portion of the lagoon. Everywhere that we went in the Ponapé lagoon, we found sponges flourishing.

A second factor for sponge success is also well exhibited in Ponapé. This concerns the ratio of land drainage to sea area.

This relationship was brought out strikingly in my studies at Bermuda (de Laubenfels, 1950 "Ecology"). There are no permanent freshwater streams in Bermuda, but there are little gullies down which temporary streams flow during and immediately after a hard rain. Right at the mouth of such a gully, there is consistently an area with no sponges at all, doubtless due to the lethal effects of sudden flushing with fresh water, which causes violent changes in osmotic relationships. Yet, just farther out than this blank area, there occurs one of extremely great sponge success. Sponges may even cover the bottom and all available solid surfaces, crowding each other and making a continuous mass more than 10 cm thick. The landward side of this crowd is fairly sharp. The "twilight" zone may be less than 10 meters wide. At the seaward side, however, the sponge abundance diminishes gradually over a much longer distance.

Only rough estimates are available for sponge abundance in the Gulf of Mexico, but the reports of divers for commercial sponges are unanimous as to the general picture that a certain region south of the western prolongation of Florida, represented by the star in Figure 186, has been the second greatest area for sponge yield in the whole world and is excelled only slightly by that in the eastern Mediterranean.

It might at first be thought that the region of maximum abundance would be at the place marked with the figure *1*, then less abundance at *2* and still less at *3*. That this is not the case is obviously due to the fairly strong currents, which in this inland sea sweep from Texas toward Florida. Taking these into



Text Figure No. 186. Diagram to show (by a star) displacement by currents (arrows) of the area of greatest sponge abundance.

account, it is clear that the Gulf of Mexico presents a pattern of sponge abundance which (on a large scale) is in complete harmony with that exhibited (on a small scale) at Hungry Bay, Bermuda. The region most favorable to sponges is displaced eastward about 600 kilometers from the mouth of the river.

The only region of greater sponge abundance than that of Western Florida is that about the Aegean Islands of the Eastern Mediterranean Sea. Here again a huge river, the Nile, empties into an inland sea, and the region of maximum abundance is about 600 kilometers out beyond the river mouth. This distance must, of course, be greater for a large river than for a small one and be also influenced by the strength of the prevailing currents.

The hypothesis is here definitely advanced, that the world's greatest sponge beds, those of Greece and Asia Minor, are built up by the River Nile, and the second greatest, those of Western Florida, are built up by the Mississippi-Missouri Rivers. These are two of the world's greatest rivers. Yet how about such another one as the Congo? At 600 kilometers from its mouth, the ocean is some 4000 meters deep. The same is true for that greatest of all rivers, the Amazon. Yet it is noteworthy that the deep sea dredgings of the "Challenger" yielded especially numerous deep sea sponges off shore from the Amazon mouth.

For ideal sponge conditions, land drainage should debouch into an enclosed area of fairly shallow depth and of moderate currents. This ecological situation exists in the lagoons all around Ponapé.

What is the favorable item, or what are the favorable items? Full

oceanic salinity is obviously important, and the lack of salinity in land drainage is merely an obstacle to be overcome. The helpful factors must have been in solution or in suspension in the drainage. It is here suggested that there are many such factors—some organic, some inorganic. Further study of this situation needs to be correlated with the matter of sponge nutrition, a subject about which all too little is known.

Throughout the four groups of islands, temperatures were frequently taken. That of the air, during June, July, August, and September, was consistently near 30° C. Even the predawn temperature seldom fell to 28°. Only at Guam did daylight temperatures often go above 32°, but on that island it was frequently as high as 33°. I did not take open ocean readings. Lagoon temperatures were almost always a little under the temperatures of air in daylight, but varied in place to place from 28° to 29°. In water so shallow that one could wade in it, however, the water temperature in daylight was higher than the air temperature. For example, on June 25, 1949, at Ailinglap-lap Atoll, near Bikájela Islet, the noon air temperature was 30°, but the noon water temperature where the depth was only one meter was 32°.

The lagoons about Guam should be studied carefully as to temperature. On September 20, 1949, I encountered a remarkably warm water region in Merizo Bay at the south end of Guam. Unfortunately, I did not have a thermometer in the canoe at this time. This was in a place where a gentle current had been flowing over a table reef, with the water depth chiefly under 2 meters, often under 1 meter. A traverse of about a kilometer of such shallows led to warmer and warmer water, and the two divers began to exclaim that the water was hot. I tested it with arms and legs, and it was definitely like what one would have for water in a bathtub. It was doubtless not quite 40°, but it certainly did not fall many degrees short of that temperature. There were no sponges in this region of (at least intermittently) hot water.

The coldest temperatures encountered during the summer were at the furthest south point, at Ebon Atoll, latitude 4° 35′ north. On two successive nights I required a blanket covering for comfortable sleep, and it was noteworthy that the natives had blankets ready to use for themselves, as well as to lend. On July 5th, the dawn air temperature was only 26°, and I am sure it had been at least a little cooler before dawn. On the same day the afternoon air temperature reached 29.5°.

Year around inhabitants of these four groups of islands state that there is little diurnal variation in temperature of air and water and that also there is remarkably little seasonal or annual variation. Therefore, it appears likely, except for small, local, peculiar situations (such as at Merizo Bay, above mentioned) that fluctuation of temperature plays no very great part in the ecology of the Porifera of the Western Pacific.

Sponges exhibit great effects of ecological nature in response to neighboring forms of life. Of course, the effects received from other living organisms

always arrive in the form of physico-chemical items, but these may well be put in a special category.

Mangrove thickets offer one of the best examples of such a biological relationship. These thickets seem to occur in Micronesia exclusively where the substratum is entirely or chiefly volcanic rock, avoiding predominately calcareous regions. In the Bermudas, mangroves thrive where only calcareous rock occurs, and much the same situation exists through the West Indian regions. It may be that calcareous shore is quickly eroded, producing a depth too great for mangroves.

Near and within mangrove thickets, the water is commonly tinted brown, due to some substances derived from the plants. In this discolored, often dirty water, sponges thrive, as, for example, the genera *Spongia, Biemna, Adocia (turquoisia),* and *Anthosigmella.* Many species which grow in the mangrove vicinity are absent from other regions.

There are scattered regions, often several acres in size, where there are dense thickets of staghorn coral *(Acropora)* but little or no coral of any other genus. I was not able to correlate the occurrence of these areas with ecological factors, but such doubtless exist. It was very noteworthy, however, that exceedingly few, if any sponges at all could be found in and about these staghorn jungles.

There are regions where it is strikingly obvious that many different species of Anthozoan coral occur intermingled, especially the kind of coral that forms horizontal or almost horizontal shelves or "table top" shapes. Such regions were usually also teeming with sponge life. Clearly, that which favors diversity of coral favors Porifera. Yet, one noteworthy exception was found.

The value of land drainage has been dwelt upon. Was this akin to fertilization by manure? In the north portion of Ailing-lap-lap lagoon occurs a small islet of about 4 or 5 acres, called Matien. Many hundreds of sea fowl, chiefly terns, nest on this islet and roost there the year around even when not nesting. Thus, there is a rich drainage of nitrogenous material into the waters adjacent to Matien. I anticipated finding a correspondingly rich sponge fauna but was disappointed. Further study, however, disclosed that whereas only a moderate number of sponges occurred, say one per each 25 square meters, practically every exposed centimeter upon which a sponge could conceivably grow was occupied by a sponge. In other words, the coral was so exceedingly vigorous, that the usual big patches of dead coral were wanting. Sponges cannot attach to and grow on living vigorous Anthozoan coral. I believe, if suitable substrates were provided about Matien, that sponges would thrive there. This situation may be one of the few in which sponges are crowded out by the superior competition of other sessile invertebrates.

Throughout all the Micronesian collecting, the nearly invariable substrate for sponge attachment was dead coral. A very few, such as *Anthosigmella*

and *Cinachyra,* grow in sand. A few grew on other living sponges, but this is probably not a typical substrate. *Cliona* and *Aka* actually burrow into calcium carbonate (often dead coral) and live concealed.

Sponges occur commonly on vertical surfaces. They do occur on the upper surfaces of horizontal structures but do so chiefly when no other placement is available. This latter is obviously less favorable to their long life than are vertical surfaces. Danger of debris settling on them and occluding their apertures doubtless is involved. Where a cave is so placed that there is a ceiling, that is to say, the under surface of a horizontal structure, this ceiling gives evidence of being better for sponges even than are vertical surface attachments. For this reason, an excellent method of finding numerous sponges (although small individuals) is to keep lifting blocks of dead coral. If the block was settled into sand or mud, no sponges live on its under surface. If there was a space of open water between the block or slab, its surface may be nearly covered with sponges. Many of these are mere incrustations, thin as paper, but some are a little larger than that. Throughout the Marshalls, Carolines, and Palaus, the common sponges so placed were of the genus *Spirastrella.*

One whole bay in the Palaus, near Malakal Islet, contained only two or three small specimens of *Stylotella* (which is the most widespread and hardy sponge in Micronesia) and numerous huge specimens of *Stellettinopsis.* I was unable to find *Stellettinopsis* anywhere else in the archipelago. The reason for this peculiar distribution is not clear. The bay was relatively exposed, and, therefore, constituted a comparatively poor sponge environment.

In several localities near Koror, in regions which ecologically I should anticipate as being very favorable for sponges, there were indeed many, but all were of the genus *Hiattrochota.* It was not clear why other genera were absent. A biologist who could spend months in this interesting area with chemical equipment might find such problems quite interesting and possible to solve.

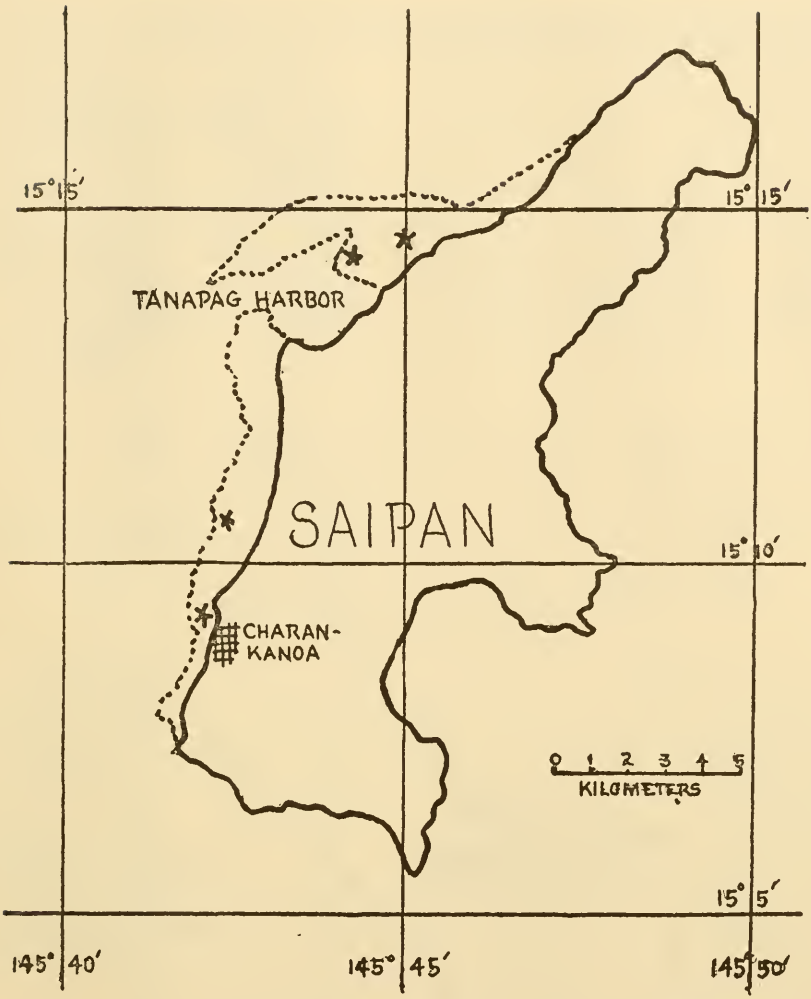
Sponges of the Marianas

The outstanding sponge of Saipan is *Stylotella agminata* (Ridley) Lendenfeld, which is the most widespread and in terms of aggregate mass, the commonest sponge in Micronesia. At Saipan, however, it was found only in Tanapag Harbor, usually at 2 to 4 meters depth. Its distribution includes the Marshalls, Ponapé, Truk, the Palaus, and Australia.

Near Charankanoa, in depths of less than one meter, in an area of less than an acre, are found the following two species.

Haliclona streble, new

Cinachyra porosa (Lendenfeld) Burton. This occurs also in the Marshalls, Palaus, and Australia. It is curious to note that *C. australiensis* occurs



Text Figure No. 187, Map number 2. Saipan Island in the Marianas. Stars mark areas where sponges were found in some abundance.

not only in Australia but also in Ponapé, Truk, and the East Indies. *C. porosa* would seem, therefore, to have a more peripheral and *C. australiensis* a central distribution.

A collection of sponges from the lagoon west of Saipan was made in May and June, 1949, by P. E. Cloud, Jr.; sent to the United States National Museum; and forwarded from the Museum to me for identification subsequent to writing this account. The Museum has designated all the specimens by the same acquisition number, 183733. *Stylotella agminata* seems to have been the commonest species then as it was when I collected. The *Cinachyra* that I found was not found by Cloud. His collection contains an unidentifiable

Haliclona. The third of my three Saipan species was *H. streble* (new). In addition to the *Stylotella,* Cloud's collection includes:

Genus	Species	Author	Located—de Laubenfels	Located—Originally
Adocia	*neens*	(Topsent)	Likiep, Majuro, Ponapé	West Indies
Spirastrella	*potamophora*	(de Laubenfels)	Likiep, Majuro, Ebon, Ponapé	(new)
Jaspis	*tuberculata*	(Carter)	Likiep	Australia
Tethya	*diploderma*	(Schmidt)	Likiep, Hawaii	(Circumequatorial)
Chondrilla	*australiensis*	(Carter)	Likiep, Majuro	Australia
Chondrilla	*grandistellata*	(Thiele)	Likiep	East Indies
Leucetta	*primigenia*	(Haeckel)	Ponapé	Australia, Indian Ocean

Text Figure No. 188, Map number 3. Guam Island, in the Marianas. The scale reads in kilometers. Stars mark areas where sponges were found in some abundance.

At Guam, much of the very shallow lagoon was entirely devoid of sponge life. On the central portion of the northwest coast, there is an indentation called Agana Bay. In it, between 2 and 3 kilometers northeast of Agana, is a region sometimes called Dungas Beach. There is a lagoon which is in places more than 2 meters deep and is sheltered not only by the hilly land on three sides and by the offshore reef but also by a small islet. Inshore from this islet there were abundant sponges of the species identified as *Haliclona ligulata* and *Callyspongia diffusa.* There were less common but fairly numerous specimens of *Adocia viola* and *Kieplitela antrodes.* We also found one specimen each of *Pellina pulvilla, Thalysias frondifera,* and *Terpios aploos.*

At the extreme south end of Guam, there is a triangular lagoon called Merizo Bay. Each side of the triangle is a little over 2 kilometers. The shore of the main island forms one side. A smaller island, called Cocos Island, is at the opposite apex. Much of this lagoon is less than a meter deep at low tide, but some of it is more than 2 meters deep. Especially in these deeper pools we found moderately common individuals of *Adocia viola, Kieplitela antrodes, Stylotella agminata;* and by breaking up dead coral we found *Aka trachys.*

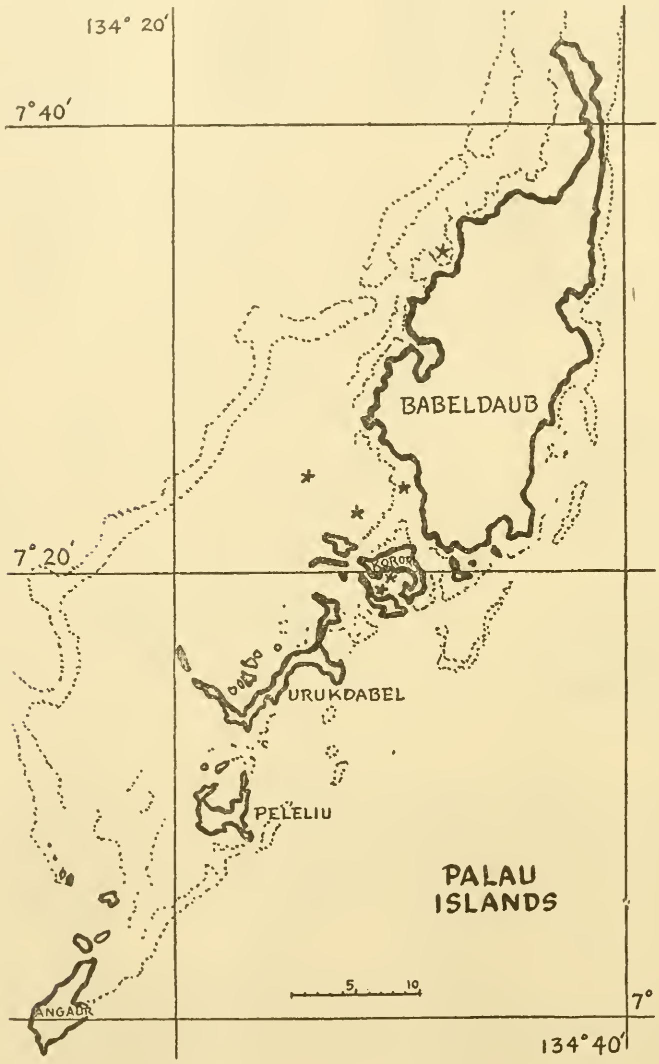
Table 1. Analysis of Guam Sponges
(Key: +, abundant; —, rare)

Genus and species at Guam	Guam	Palau	Truk	Ponapé	Marshalls	Elsewhere
1 Haliclona ligulata	+					Australia
2 Callyspongia diffusa	+	+		+		East Indies, Indian Ocean, Hawaii
3 Pellina pulvilla						East Indies
4 Adocia viola	+			+		....
5 Kieplitela antrodes	+	+		+	+	....
6 Thalysias frondifera						East Indies
7 Terpios aploos					—	....
8 Stylotella agminata	+	+	+	+		Australia
9 Aka trachys						....

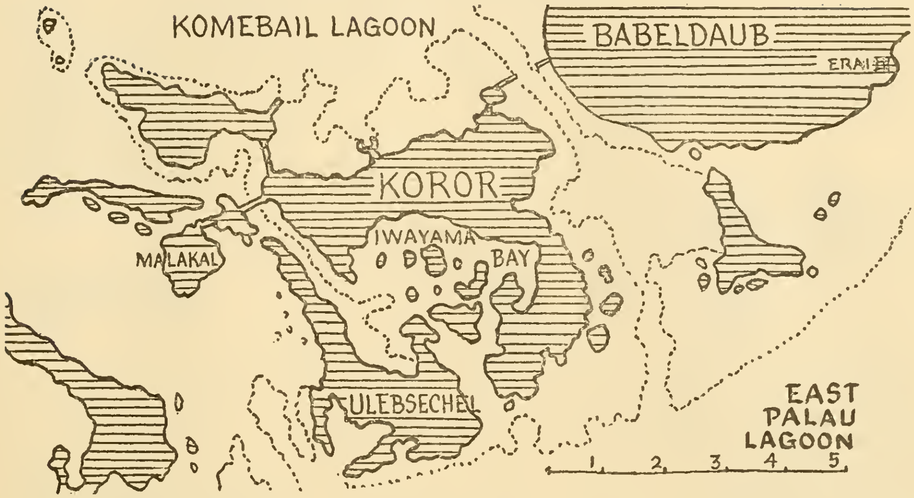
The Palau Archipelago proved to be very rich in sponge life. I found 51 species there, which is almost the same number as at Ponapé. The Palau area being larger than that at Ponapé, the comparative abundance would seem to be somewhat less. On the other hand, Tanita in 1943 found three species of sponge in the Palaus, none of which I could find. Thus, their recorded sponge fauna becomes 54 species.

Iwayama Bay, so nearly perfectly landlocked, yet with constant gentle currents, proved to have abundant sponges. Prior to 1941, Japanese authorities maintained a biological research station on this bay. They wisely selected it as superlative in the Western Pacific region. I would say, as my opinion, that Lemotol Bay in the Truk region was perhaps a trifle richer in marine life, but the two bays are outstandingly interesting.

Sponges were also found to be at least moderately common throughout the whole large lagoon area about the Palaus. I watched many kilometers of lagoon floor, using the viewing box or water glass, while our boat was being slowly rowed or propelled by outboard motor. Every few meters, there was a sponge or group of sponges. Near mangroves, the abundance was especially noticeable. *Spongia zimocca,* the *Phyllospongias, Neopetrosia pandora, Cal-*



Text Figure No. 189. Map number 4. Palau Islands. The scale reads in kilometers. Stars mark areas where sponges were most studied.



Text Figure No. 190, Map number 5. A portion of the Palau archipelago, to illustrate Iwayama Bay.

lyspongia diffusa, Adocia turquoisia, Sigmadocia emphasis, Biemna fortis, and *Anthosigmella vagabunda* were all very common in such localities.

As at Truk, it was often noticeable that sponges were especially abundant where the water was more green than blue. This emphatically does not refer to the color which was reflected from the surface but to that which was observed against a white coral background as seen with the viewing box, and allowance was made for depth. This undoubtedly has to do with material dissolved and suspended in the water and has bearing on sponge nutrition. Chemical analyses of such waters should be instructive.

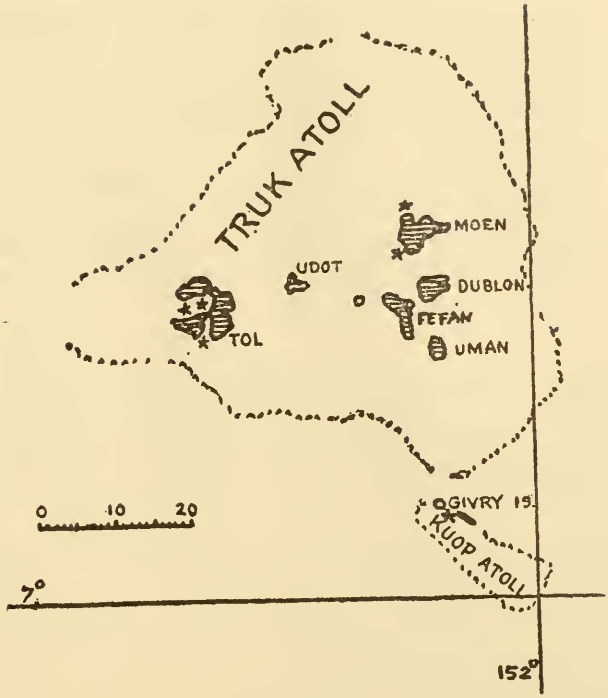
In the Palaus I dwelt on Koror Island, adjacent to Iwayama Bay, and studied that bay repeatedly. It was also possible to explore fairly carefully the large lagoon (Komebail Lagoon) north and east of Koror. We also studied the sponges along the west coast of Babeldaub Island, for a distance of about 20 kilometers up to the region where, prior to 1940, the Japanese had maintained a sponge-propagating farm.

In the Truk region I dwelt on Moen Island and studied the sponges (or lack of) completely around this island—a circumference of about 16 kilometers. It was also possible to study a line or traverse off to the northwest about 2 kilometers, to a small islet called Scheiben. I was also able to obtain transportation to a reportedly most suitable area in the western part of the lagoon and found the sponge situation to be very interesting. I dwelt temporarily on Pollé Island and studied sponges and their ecology in the bay south-

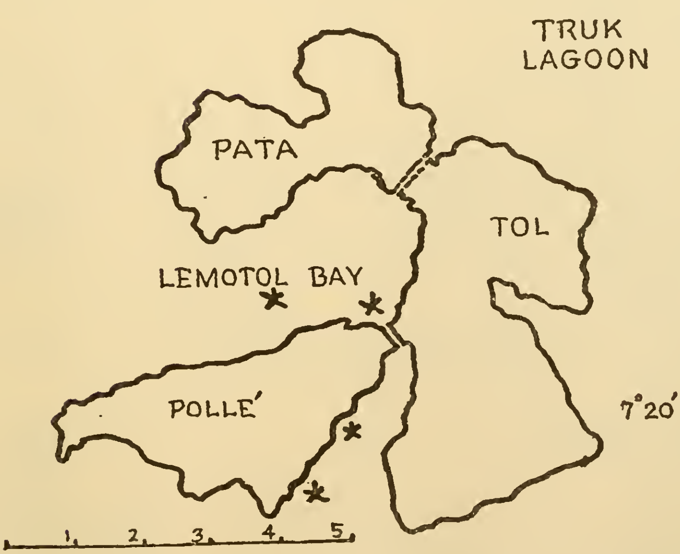
Table 2. Analysis of Palau Sponges

(Key: +, abundant; —, rare)

Genus and species	Palau	Truk	Ponapé	Marshalls	Elsewhere
1 Spongia zimocca, sub. irregularis	+		+		Circumequatorial, in various subspecies; subspecies irregularis is Australian
2 Hippiospongia metachromia	—				
3 Phyllospongia lekanis	+				
4 Phyllospongia complex	+				
5 Polyfibrospongia dysodes	—				
6 Ircinia ramosa	+				West Indies, probably circumequatorial
7 Spongionella chondrodes	—				
8 Thorectopsamma mela	+	+	+	+	
9 Thorectopsamma xana	—	—		+	
10 Dendrilla nigra	—			—	Indian Ocean
11 Dendrilla verongiiformis	+				
12 Halisarca melana	—				
13 Haliclona koremella	—				
14 Haliclona korema	—			—	
15 Haliclona viridis	—		—	+	West Indies
16 Cribrochalina olemda	+	—			
17 Neopetrosia pandora	+	+	+	—	
18 Callyspongia diffusa	+		+		East Indies, Indian Ocean, Hawaii
19 Gelliodes gracilis	+				East Indies
20 Gelliodes callista	—				
21 Protophlitaspongia aga	—				
22 Pellina carbonaria	—				West Indies
23 Adocia turquoisia	+	+	+	+	
24 Toxadocia tyroeis	—				
25 Sigmadocia emphasis	+				
26 Kallypilidion poseidon	—	—			
27 Ichnodonax kapne	—				
28 Kieplitela antrodes	+		+	+	
29 Hiattrochota baculifera	+				Australia, East Indies, Indian Ocean
30 Tedania ignis	+				West Indies, Hawaii
31 Lissodendoryx oxytes	—				
32 Clathria fasciculata	—				Philippines
33 Dictyociona mima	+				
34 Mycale armata	+		+	+	East Indies
35 Folitispa pingens	+		+		
36 Biemna fortis	+	+	+		Indian Ocean
37 Pseudaxinella pitys	—				
38 Ciocalapata sacciformis	—				Indian Ocean
39 Dictyonella dasyphylla	—				
40 Hoplochalina agoga	—				
41 Anthosigmella vagabunda	+	+	+	+	Indian Ocean, Philippines
42 Ridleia peleia	—				
43 Stylotella agminata	+	+	+		Australia
44 Cliona schmidtii	+				Circumequatorial
45 Stellettinopsis isis	—	—			
46 Jasplakina nux	—	—	—	—	
47 Hezekia walkeri	+		+	+	
48 Cinachyra porosa	+				Australia
49 Samus anonyma	—				Australia, Indian Ocean, West Indies
50 Chondrilla acanthastra	—				
51 Leucetta avocada	+	+			
52 Leuconia tropica	—				
53 Leuconia palaoenses	—				
54 Scypha plumosa	—				



Text Figure No. 191, Map number 6. Truk. The scale reads in kilometers. Stars show areas where sponges were most studied.



Text Figure No. 192, Map number 7. The region of Lemotol Bay (also called, in Trukese, Nemoton Bay). The scale reads in kilometers. Stars show areas where sponges were most studied.

east of Pollé. We then went through the mangrove swamp which joins Pollé to Tol Island and came out in Lemotol Bay, which is north of Pollé, west of Tol, and south of Pata Islands. I found this bay to be exceptionally rich in marine life of all kinds and studied it rather carefully in view of the limited time available.

Just south of Truk is a small uninhabited atoll which is called by the Japanese Kimi shima or Kinjima but has a native name of Kuop. It has only three islets, and but one of them, called Givry, is large enough to have trees. This was densely forested with coconut palms and breadfruit trees. In the

Table 3. Analysis of Truk Sponges

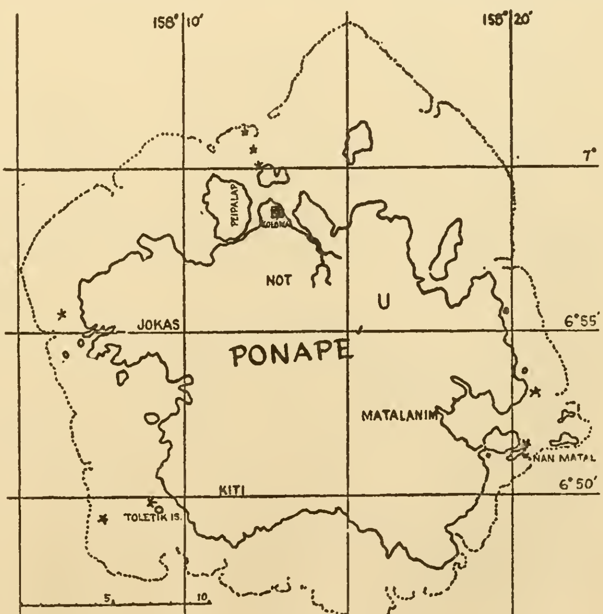
(Key: +, abundant; —, rare)

Genus and species	Truk	Palau	Ponapé	Marshalls	Elsewhere
1 Hippiospongia communis, subspecies ammata	+		+		Other subspecies are circumequatorial
2 Heteronema eubamma	—				
3 Thorectopsamma mela	+	+	+	+	
4 Thorectopsamma xana	+		+	+	
5 Haliclona monilata	—				Australia, East Indies
6 Haliclona coerulescens	—				West Indies
7 Reniclona decidua	—				Indian Ocean
8 Cribrochalina olemda	+	+			
9 Xestospongia sapra	+			—	Yap
10 Neopetrosia pandora	+	+	+	—	
11 Adocia turquoisia	+	+	+	+	
12 Kallypilidion poseidon	+	+	—	—	
13 Myrmekioderma granulata	+				East Indies
14 Hiattrochota hiatti	+				
15 Hiattrochota mystile	—			+	
16 Tedandoryx lissa	—				
17 Thalysias cervicornis	+		+		East Indies
18 Clathria fasciculata	+	+			Philippines
19 Clathria abietina	+			—	East Indies
20 Microciona placenta	—				Australia
21 Iotrochostyla iota	+				
22 Desmacella lampra	+				
23 Axocielita linda	+			+	
24 Biemna fortis	+	+	+		Indian Ocean
25 Homaxinella phrix	—				
26 Nailondria maza	+				
27 Densa mollis	—				
28 Prianos osiris	—				
29 Spirastrella decumbens	+			+	East Indies
30 Anthosigmella vagabunda	+	+	+	+	Indian Ocean, Philippines
31 Aaptos chromis	—				
32 Stylotella agminata	+	+	+	+	Australia
33 Cliona lobata	+				
34 Stellettinopsis isis	+	+			
35 Jaspis stellifera	+				Australia
36 Cinachyra australiensis	+		+	+	Australia, East Indies

fallen, rotting fruit, an almost unbelievably immense population of flies had bred. In its lee the shallow water was very richly supplied with sponges, especially *Hippiospongia communis* of the best commercial quality that I found anywhere in the Micronesian region. There were also *Dysidea herbacea, Echinoclathria waldoschmitti, Axinosia xutha, Stylotella agminata, Lipastrotethya ana,* and *Leucetta avocada.* Of these, I found only the *Hippiospongia* and *Stylotella* also in Truk.

Dysidea herbacea occurred also in the Marshalls (Ailing-lap-lap) and has been hitherto recorded from the region of the Indian Ocean, East Indies, and Australia. I found *Leucetta avocada* also in the Palaus; it is not recorded elsewhere.

On Ponapé, I studied the lagoons, especially in regard to sponges, at the southwest portion, northwest portion, and mid-eastern portion of the island. It was possible here, as not at Truk or the Palaus, to survey a line all the way from shore across the lagoon to the outer reef. The greatest sponge abundance was found definitely to be in the deeper water halfway between reef and shore. Nearer the shore the abundance decreased only slightly. Near the outer reef it fell off sharply. From the line of breaking surf toward the outer shore as far as the reef might be uncovered or nearly uncovered at low tide, I could find no sponges at all. For a hundred meters or thereabouts just inside the reef, sponges were extremely rare, and those that did occur were usually *Stylotella agminata* or some of the incrusting ones that live under stones. In view of these observations at Ponapé, I do not



Text Figure No. 193, Map number 8. Ponapé. The scale reads in kilometers. Stars show areas where sponges were most studied.

Table 4. Analysis of Ponapé Sponges

(Key: +, abundant; —, rare)

Genus and species	Ponapé	Palau	Truk	Marshalls	Elsewhere
1 Spongia officinalis, sub. matamata	—				Other subspecies are circumequatorial
2 Spongia zimocca, sub. irregularis	+	+			Australian. Other subspecies are circumequatorial
3 Hippiospongia communis, sub. ammata	+		+		Other subspecies are circumequatorial
4 Ircinia ramosa	+	+			Circumequatorial
5 Druinella tyroeis	—				
6 Thorectopsamma mela	+	+	+	+	
7 Dysidea avara	—			—	Circumequatorial
8 Dysidea rhax	—			+	
9 Dysidea crawshayi	+			+	West Indies
10 Aplysilla sulfurea	+			+	Circumequatorial
11 Aplysilla polyrhaphis	—				California
12 Haliclona viridis	+	+		+	West Indies
13 Reniclona permollis	+				Circumequatorial
14 Neopetrosia pandora	+	+	+	—	
15 Callyspongia diffusa	+	+			East Indies, Indian Ocean, Hawaii
16 Oxymycale stecarmia	—				
17 Protophlitaspongia ada	+				
18 Adocia viola	+				
19 Adocia neens	+			+	West Indies
20 Adocia turquoisia	+	+	+	+	
21 Agelas mauritiana	—			+	Indian Ocean
22 Kieplitela antrodes	+	+		+	
23 Myrmekioderma tylota	+				
24 Hiattrochota ditrochota	+				
25 Psammascus ceratosus	+				Australia, East Indies
26 Thalysias cervicornis	+		+		East Indies
27 Thalysias cratita	—				East Indies
28 Axociella arteria	+				
29 Mycale armata	+	+		+	East Indies
30 Carmia stegoderma	—				
31 Oxycarmia confundata	—				
32 Folitispa pingens	—	+			
33 Biemna fortis	—	+	+		Indian Ocean
34 Biemna mnioeis	—				
35 Auletta bia	+				
36 Pararhaphoxya tenuiramosa	—				Australia
37 Phycopsis terpnis	—				
38 Rhaphisia hispida	—				
39 Spirastrella potamophora	+			+	
40 Anthosigmella vagabunda	+	+	+	+	Philippines, Indian Ocean
41 Terpios fugax	—			—	West Indies
42 Stylotella agminata	+	+	+		Australia
43 Cliona euryphylla	+				Eastern Pacific
44 Placospongia melobesioides	—				Circumequatorial
45 Dorypleres splendens	+				
46 Hezekia walkeri	+	+		+	
47 Cinachyra australiensis	+		+	+	Australia, East Indies
48 Craniella abracadabra	—				
49 Paratetilla lipotriaena	—				
50 Plakortis lita	+			—	
51 Leucetta primigenia	—				Australia, Indian Ocean, Africa

regard it as a serious loss that it did not prove to be feasible for me to investigate the outer reefs at Truk or the Palaus. I doubt that many sponges would be found on them. Dredging just outside the reef might, however, yield quite a few species, as indicated by my studies in Ebon Atoll of the Marshalls.

In eastern Ponapé, Matalanim Province, there is an island called Nan Matal on which occur immense and interesting ancient ruins which are built of basalt blocks. Between Nan Matal and the main island, the water is so shallow that one may easily wade back and forth. These shallows have a bottom of sandy mud and a fairly dense stand of a monocotyledonous seaweed sometimes called turtle grass, which has leaves about 1 cm wide and 30 to 60 cm long. These shallows have a distinctive and abundant sponge population, especially of *Spongia zimocca,* subspecies *irregularis,* and *Anthosigmella vagabunda.* Other fairly common sponges in this locality included *Neopetrosia pandora, Adocia turquoisia, Biemna fortis,* and *Nailondria maza.* These sponges often surround leaves of the seaweed, doubtlessly employing them as a substrate, as well as the fragments of dead coral which occur among the sand and mud.

Eniwetok Atoll is usually regarded as a part of the Marshall Islands, but it is so far to the west of the others that one might almost classify it with the eastern Carolines. I did not visit it myself, but collections were sent to me.

J. P. E. Morrison collected there in 1946, chiefly during April. He dredged out in the open lagoon. I did no dredging and studied only the portions of the lagoon which were 10 meters deep or less. His dredgings include the first six of the following seven species:

1 *Thorectopsamma mela.* I found this abundant throughout the Marshalls and present, but not quite so common, at Ponapé, Truk, and the Palaus. It is not reported elsewhere. The only previous records of a species of *Thorectopsamma* have been Australian and Bermudan.

2 *Callyspongia fistularis.* I found this also in the Marshalls (Majuro and Ebon); previous records have been from the Indian Ocean.

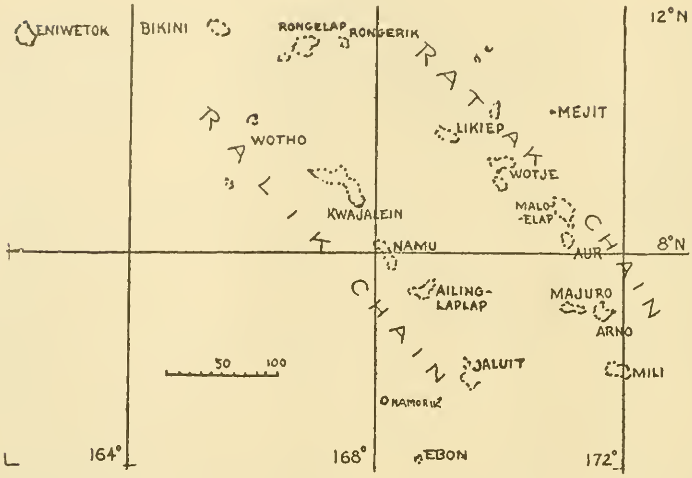
3 *Agelas mauritiana.* I also found this at Majuro and Ebon. Morrison found it also at Bikini. It is the only sponge found in 1946 at both Eniwetok and Bikini.

4 *Lissodendoryx calypta.* This is a unique record.

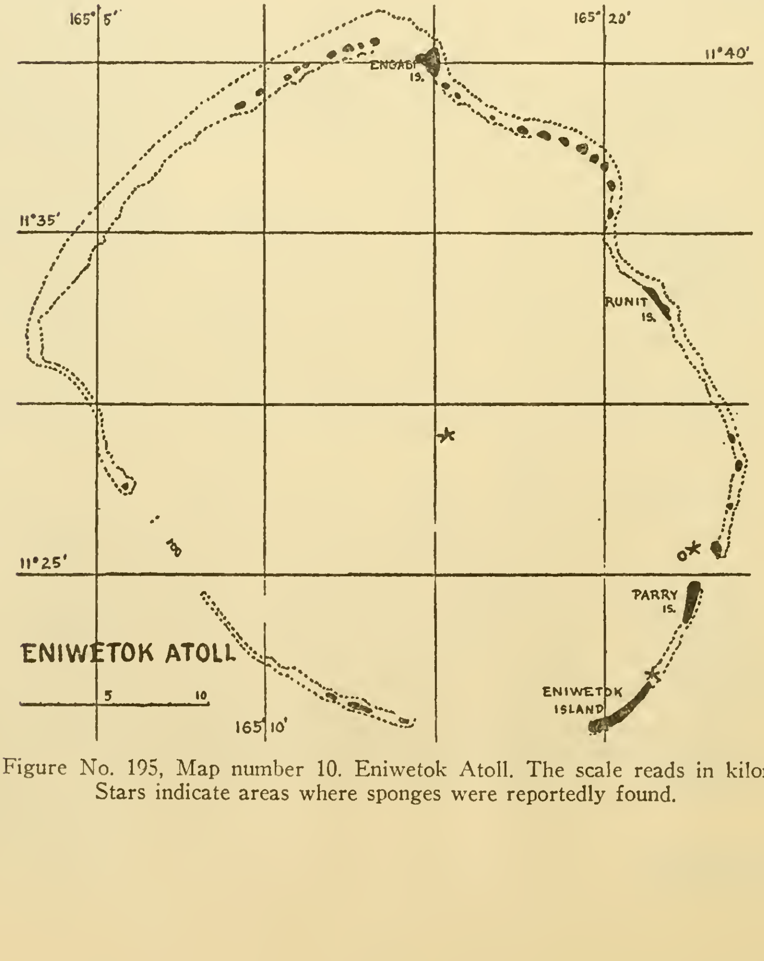
5 *Clathria abietina.* I found this also at Truk. Previous records were probably, but not certainly, East Indian.

6 *Anthosigmella vagabunda.* I found this abundant throughout the Marshalls, Ponapé, Truk, and the Palaus. Earlier records are from the Indian Ocean and Philippines.

7 *Hezekia walkeri.* This was not dredged. I found it common at Likiep in the Marshalls and also at Ponapé and the Palaus. Bayer found it at Bikini in 1947. It is one of the four species found both at Bikini and Eniwetok in that year.



Text Figure No. 194, Map number 9. The Marshall Islands. The scale reads in kilometers.



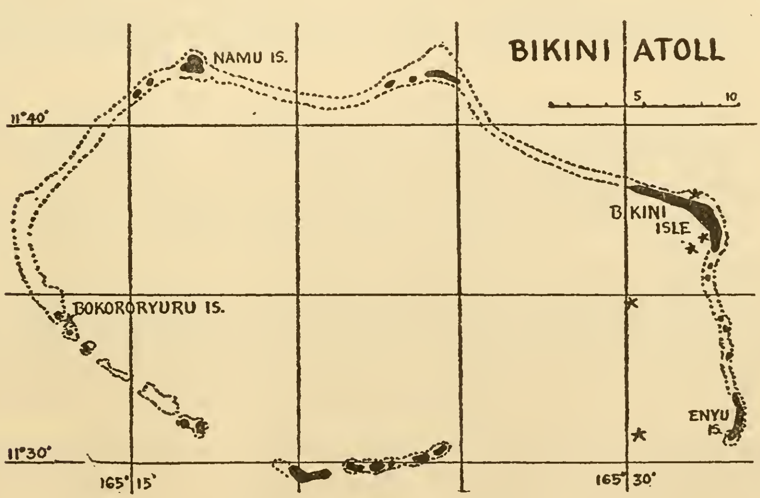
Text Figure No. 195, Map number 10. Eniwetok Atoll. The scale reads in kilometers. Stars indicate areas where sponges were reportedly found.

T. E. Bullock collected at Eniwetok in the summer of 1948. He did not find a single sponge species that Morrison had found there in 1946, nor did Morrison find a single one of those discovered by Bullock.

No data has been given to me as to Bullock's collection methods—whether dredging, diving, or wading—and no depths are given. Nor is there any information as to what part of the atoll is represented. His Eniwetok collection includes the following six species:

1 *Ircinia halmiformis.* This is a very strange sponge, previously known only from Australia. I did not find it anywhere.
2 *Thorectopsamma xana.* I found it in abundance in the Marshalls, less common at Truk and the Palaus. It is not reported elsewhere.
3 *Spirastrella decumbens.* I found it common throughout the Marshalls, and at Truk. It has been hitherto known as an East Indian species.
4 *Aaptos unispiculus.* I did not find it anywhere. It has been recorded from the Indian Ocean region.
5 *Jaspis stellifera.* I found it at Truk. The earlier records are Australian.
6 *Chondrilla australiensis.* I found it in the Marshalls (Majuro and Likiep). Earlier records are Australian.

Bikini Atoll is the nearest to Eniwetok of any of the Marshall Islands. I did not visit it personally, but it has been much studied. Twelve species of sponge were collected there in 1946 and sent to me for study. All of these were collected by J. P. E. Morrison, except numbers 9 and 10 which were collected by F. M. Bayer. Numbers 2 to 8, inclusive, were dredged out in the



Text Figure No. 196, Map number 11. Bikini Atoll. The scale reads in kilometers. Stars indicate areas where sponges were reportedly found.

central portion of the lagoon. The other five came from very shallow water and were collected while wading. The twelve are:

1 *Spongia officinalis.* The local subspecies, common in the Marshalls, is rare at Ponapé and not reported elsewhere. The main species is circumequatorial.

2 *Haliclona korema.* I found a species in the Palaus which I have thus named. Morrison found a sponge rather common at Bikini which is like *korema* in the respects which still show in the long-preserved specimens. On the other hand, such specimens might also fit some other species nearly as well. Identification with the Palaus sponge is made only with hesitation and with the comment that other identifications appear even more open to question than this one.

3 *Neopetrosia pandora.* I did not find this conspicuous species anywhere in the Marshalls. Morrison found it only once, and that was 50 meters deep. It is abundant in shallow water (often barely below low tide) throughout Ponapé, Truk, and the Palaus.

4 *Adocia turquoisia.* I found this at Majuro in the Marshalls and also at Ponapé, Truk, and the Palaus. It is not recorded elsewhere.

5 *Agelas mauritiana.* I found this at Majuro, Ebon, and Ponapé. Morrison found it also at Eniwetok. Earlier records have been from the Indian Ocean.

6 *Kieplitela antrodes.* I found this at Likiep in the Marshalls, also at Ponapé, the Palaus, and Guam. It is not recorded elsewhere.

7 *Halichondria adelpha.* The only other record is mine from Ebon.

8 *Hymeniacidon dystacta.* I found one little specimen at Ebon. Morrison found many at Bikini. These are all dubious specimens—not to be allocated with confidence but apparently at least conspecific with each other.

9 *Tethya actinia.* I found this also at Ebon. Earlier records are East Indian and West Indian (Bermuda).

10 *Hezekia walkeri.* Morrison found this at Eniwetok. I found it common at Likiep and also at Ponapé and the Palaus. It is not recorded elsewhere.

11 *Cinachyra australiensis.* This may be a new, unique species of *Cinachyra.* It is put with *australiensis* only with reservation. Bullock's 1948 collections agree with the 1946 ones. Sponges that are certainly *australiensis* have been recorded from Australia and the East Indies, and I found it also at Ponapé and Truk.

12 *Chondrosia chucalla.* This is the only point of agreement between Bikini and Ailing-lap-lap, where I found this *Chondrosia.* It is elsewhere reported only from Australia. Yet it is a very dubious agreement, because the long preserved specimen from Bikini was not such

that I could identify it with any certainty. It is put here largely on surmise.

T. E. Bullock collected in 1948, also at Bikini as well as at Eniwetok. This collection was also sent to me, but again without data, only that these sponges were from somewhere in Bikini. Seven species are included, and quite unlike the situation at Eniwetok, more than half of them had been in the earlier collections by Morrison.

1 *Spongia officinalis* subspecies *matamata.* This also was in Morrison's collection from Bikini.
2 *Ircinia halmiformis,* also in Bullock's collection from Eniwetok.
3 *Thorectopsamma xana,* also in Bullock's collection from Eniwetok.
4 *Adocia turquoisia,* also in Morrison's collection from Bikini.
5 *Kieplitela antrodes,* also in Morrison's collection from Bikini.
6 *Cinachyra australiensis,* also in Morrison's collection from Bikini.
7 *Jaspis tuberculata.* I found this also at Likiep, earlier records have been Australian. Bullock had a *Jaspis* from Eniwetok, but it seems to be *J. stellifera* rather than *J. tuberculata.* The two are closely related.

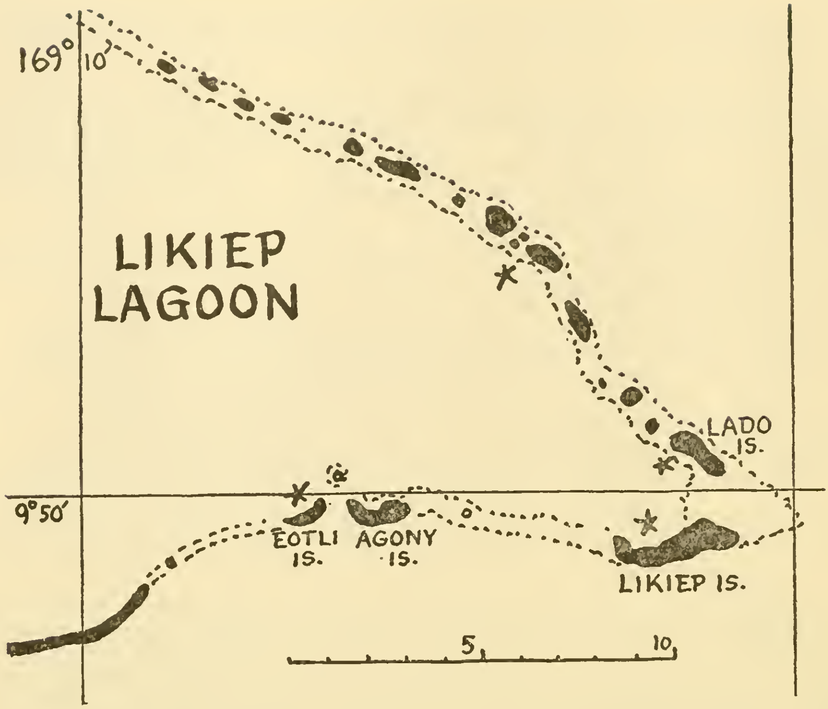
Rongerik Atoll was studied in 1947 by F. M. Bayer and F. C. Zimmerman. They collected some sponges which were sent to me for examination. Most of their specimens were *Cliona lobata,* which I found to be abundant at Likiep (near Rongerik) and at Ebon and at Truk. It is probably a cosmopolitan species and has records from Japan and many places in the Atlantic Ocean.

They also had a specimen of *Callyspongia fistularis,* which I found at Majuro and Ebon. It has been previously recorded from the Indian Ocean region.

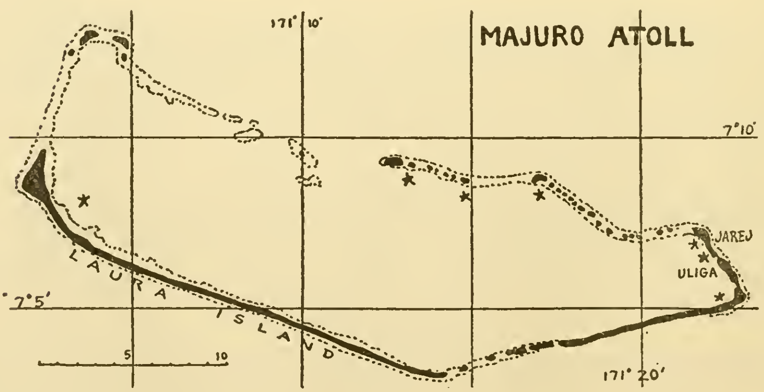
At Likiep Atoll, my studies were confined to the eastern half of the lagoon. Natives who were familiar with the entire Atoll doubted that any region in the western half would have been as suitable for sponges, and study of the charts did not give promise of extra good collecting in the western half. Transportation difficulties were a factor.

Likiep sponges were not found large in numbers or as individuals. All indications are that the more northerly atolls of the Marshalls are dryer and poorer in marine life than the more southerly atolls. They certainly have less luxuriant vegetation and fewer types of vegetation (such as breadfruit) than those which are abundant farther south.

Majuro Atoll was studied carefully, the shallow waters of the lagoon being investigated at the north, south, east, and west. In general, sponges were small and scarce. Probably the largest species was *Spongia officinalis,* found near the east end of the lagoon.



Text Figure No. 197, Map number 12. Eastern portion of Likiep Lagoon. The scale reads in kilometers. Stars indicate areas where sponges were most studied.



Text Figure No. 198, Map number 13. Majuro Atoll. The scale reads in kilometers. Stars indicate area where sponges were most studied.

Table 5. Analysis of Likiep Sponges

(Key: +, abundant; —, rare)

Genus and species	Likiep	Bikini, Eniwe-tok	Majuro	Ailing-lap-lap	Ebon	Ponapé	Truk	Palau	Elsewhere
1 Thorectopsamma mela	+	—		+	+	+	+	+	
2 Thorectopsamma xana	+	+	+	+	+		+	+	
3 Dysidea rhax	+		+		+	—			
4 Dysidea crawshayi	+		—		—	+			West Indies
5 Dendrilla nigra	—							—	Indian Ocean
6 Reniclona parietalis	—								Mediterranean
7 Reniclona rotographura	+								
8 Adocia neens	+		+			+			West Indies
9 Kieplitela antrodes	—					+		+	
10 Hiattrochota mystile	+						+		
11 Axocielita linda	+			+			+		
12 Fasubera debrumi	—								
13 Prianos phlox	+		+	+					
14 Spirastrella potamophera	+		+	+	+	+			
15 Anthosigmella vagabunda	+	—			+	+	+	+	Indian Ocean, Philippines
16 Cliona lobata	+				+		+		Atlantic Ocean, Japan
17 Jaspis tuberculata	+	—							Australia
18 Tethya diploderma	+								Circumequatorial
19 Hezekia walkeri	+	—				+		+	
20 Chondrilla australiensis	+	—	+						Australia
21 Chondrilla grandistellata	—								East Indies

Table 6. Analysis of Majuro Sponges

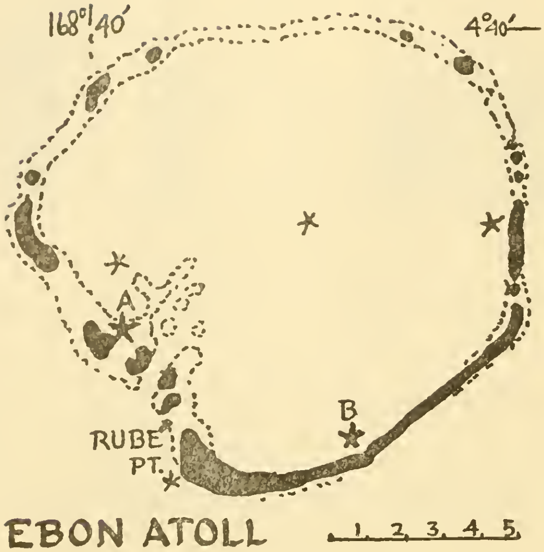
(Key: +, abundant; —, rare)

Genus and species	Majuro	Bikini, Eniwe-tok	Likiep	Ailing-lap-lap	Ebon	Ponapé	Truk	Palau	Elsewhere
1 Spongia officinalis, subspecies matamata	+	+		+		—			Main species is circum-equatorial
2 Thorectopsamma xana	+	+	+	+	+		+	+	
3 Dysidea rhax	+		+		+				
4 Dysidea crawshayi	—		+		—	+			West Indies
5 Aplysilla sulfurea	+					+			Circumequatorial
6 Halisarca metabola	—								
7 Callyspongia fistularis	+	—			+				Indian Ocean
8 Iotrochota pella	+								
9 Adocia neens	+		+			+			West Indies
10 Adocia turquoisia	+	+				+	+	+	
11 Agelas mauritiana	+	+			—	—			Indian Ocean
12 Microciona micronesia	+								
13 Ophlitaspongia mima	+								
14 Prianos phlox	+		+	+					
15 Spirastrella potamophera	+		+	+	+	+			
16 Pseudosuberites andrewsi	+								East Indies
17 Quasillina quiza	—								
18 Cryptax orygmi	—								
19 Cliona vastifica	+								Circumequatorial
20 Chondrilla australiensis	+	—	+						Australia

Table 7. Analysis of Ebon Sponges

(Key: +, abundant; —, rare)

Genus and species	Ebon	Bikini, Eniwetok	Likiep	Majuro	Ailing-lap-lap	Ponapé	Truk	Palau	Elsewhere
1 Thorectopsamma mela	+	—	+		+	+	+	+	
2 Thorectopsamma xana	+	+	+	+	+		+	+	
3 Dysidea chlorea	+								
4 Dysidea rhax	+		+	+		—			
5 Dysidea crawshayi	—		+	—		+			West Indies
6 Acervochalina velinea	+								
7 Reniclona nigra	—								West Africa
8 Reniera implexa	—								Mediterranean, Indian Ocean, Philippines
9 Nara nematifera	+	+							
10 Callyspongia fistularis	+	—		+					Indian Ocean
11 Pellina eusiphonia	—								East Indies
12 Pellina pinella	—								
13 Pellina carbonilla	+								
14 Agelas mauritiana	+	+		+		—			Indian Ocean
15 Tedania oligostyla	—								
16 Mycale armata	+					+		+	East Indies
17 Ulosa spongia	—								
18 Stylotrichophora rubra	—								Australia
19 Homaxinella trachys	+								
20 Quepanetsal madidus	—								
21 Halichondria adelpha	—	—							
22 Katiba milnei	+								
23 Hymeniacidon dystacta	—	+							
24 Neoprosypa atina	+								
25 Prianos melanos	+								
26 Spirastrella potamophera	+		+	+	+	+			
27 Spirastrella decumbens	+	+			+		+		East Indies
28 Anthosigmella vagabunda	+	—	+			+	+	+	Indian Ocean, Philippines
29 Atergia purpurea	—								
30 Terpios aploos	—								
31 Cliona lobata	+		+				+		Japan, Atlantic Ocean
32 Oxeosarcodea oinops	+								
33 Tethya viridis	+								Southwest Pacific
34 Tethya actinia	+								East Indies, Bermuda
35 Myriastra purpurea	+								Circumequatorial
36 Chondrilla nucula	+								Circumequatorial



Text Figure No. 199, Map number 14. Ebon Atoll. The scale reads in kilometers. Stars indicate areas where sponges were most studied. *A:* Location of the "pearl pool."

Ebon Atoll was studied, as to its shallow waters, on the east, south, and west. The northern rim did not appear at all promising, because of the currents and wave action there. Several reefs in the central portion of Ebon Lagoon rise nearly to the surface. Were they a little higher they would form nearly circular islets there. These were also studied both by viewing box and diver. Their sponge life was fairly abundant.

In addition to studies in the lagoon, at Ebon, but not elsewhere, I was able to collect on the seaward side of the reef. This was on the lee side, and the sponge abundance was meagre.

At the west end of Ebon Lagoon is a pool, bordered by a reef on the lagoon side, and by dry land on the other three sides. It is probably more than 20 meters deep in its center. Here, about 1940, the Japanese tried to cultivate pearl oysters and indeed some large pearl oysters do occur there. This area of about five acres (here called the Pearl Pool) proved to be especially rich in sponge species and individuals, many of fairly large size.

Thirty-six species of sponge were found at Ebon, equalling the record made at the far larger atoll of Truk.

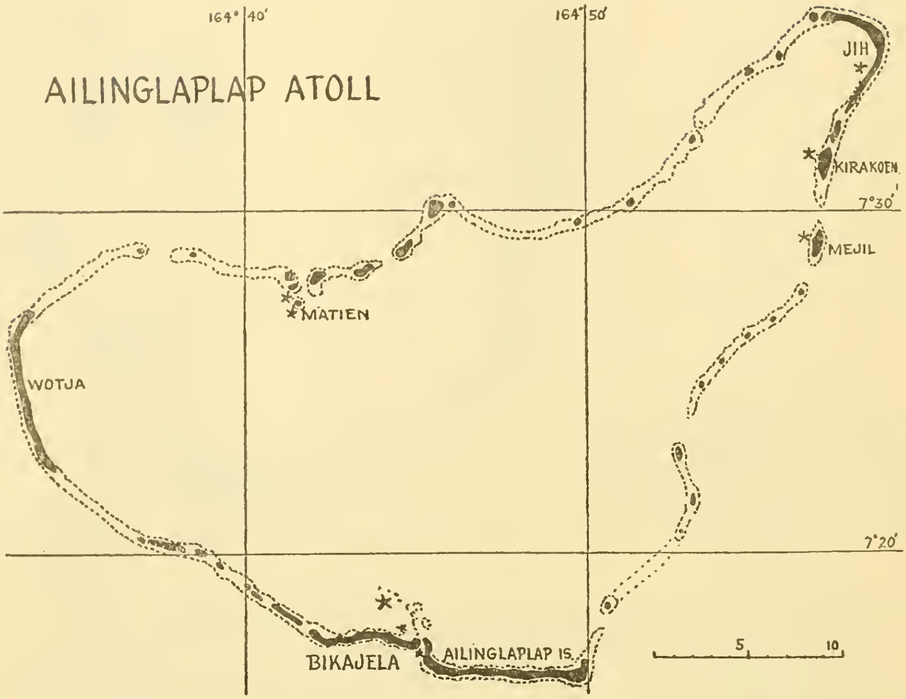
Ailing-lap-lap Atoll was the first one that I studied in 1949. A somewhat longer time was spent there than in the others. It is not quite so generously provided with sponges as is Ebon Atoll, but is very interesting. The shallow lagoon was studied in the north, east, and south. The western region did not appear to be promising, judging from studies of maps and conversations with natives.

Near Bikájela Islet, on the south rim of Ailing-lap-lap Atoll an area

Table 8. Analysis of Ailing-lap-lap Sponges

(Key: +, abundant; —, rare)

Genus and species	Ailing-lap-lap	Bikini, Eniwetok	Likiep	Majuro	Ebon	Ponapé	Truk	Palau	Elsewhere
1 Spongia officinalis, sub. matamata	+	+		+		—			
2 Aulena concertina	+								
3 Thorectopsamma mela	+	—	+		+	+	+	+	
4 Thorectopsamma xana	+	+	+	+	+		+	+	
5 Dysidea fragilis	—								Circumequatorial
6 Dysidea avara	—					—			Circumequatorial
7 Dysidea herbacea	—						—		Australia, East Indies, Indian Ocean
8 Euryspongia phlogera	—								
9 Haliclona viridis	+					+		+	West Indies
10 Reniera chrysa	—								
11 Nara nematifera	+				+				
12 Xestospongia sapra	—						+		Yap
13 Callyspongia psammophera	—								
14 Oxymycale strongylophora	—								
15 Microciona plinthina	+								
16 Anaata lajorei	+								
17 Axocielita linda	+		+				+		
18 Hymeniacidon aldis	—								
19 Prianos phlox	+		+	+					
20 Spirastrella potamophera	+		+	+	+	+			
21 Spirastrella decumbens	+	+			+		+		East Indies
22 Terpios fugax	—					—			West Indies
23 Plakortis simplex	—								Circumequatorial
24 Plakortis lita	—					+			
25 Placinolopha mirabilis	—								
26 Chondrosia chucalla	+	—							Australia



Text Figure No. 200, Map number 15. Ailing-lap-lap Atoll. The scale reads in kilometers. Stars indicate areas where sponges were most studied.

of about one square kilometer is enclosed on the south by the Islet and on the east by a reef which is exposed at low tide. This reef so bends that it partially encloses the area on the north. The northwest and west sides are open. This area proved to be very suitable for sponges, and is the location of a large sponge farm for artificial cultivation of commercial sponges. It may be the largest such farm in the world.

The deep channel between Bikájela Islet and Ailing-lap-lap Islet proved to be extremely rich in sponge life. It is 400 meters wide and about 30 meters deep. In other atolls, few or no sponges could be found in the openings between the ocean and the lagoon, especially if (as was often the case) the opening was smaller than this one. Nevertheless, it remains an interesting question as to why the Bikájela inlet was so very well provided with sponges.

In summary of this ecological and distributional discussion, we note that the sponges of these oceanic islands, thousands of kilometers from continental sponges, are principally characterized by the many which are unique. Where some can be identified with previously described species,

the Australian-East Indian region is a somewhat predominately related area. If the shallow water sponges of the Philippines were better known, much relationship might be found with them.

Yet the East Indian region is so slightly predominant as to attract attention. Out of 77 species known to occur outside the area studied, 24 or nearly a third occur in the West Indies. The more sponges are studied, the more we find new species which occur in only one small locality. On the other hand, species which were previously known to be fairly widespread are more and more discovered to be actually circumequatorial. Apparently most sponge species have either extremely narrow distribution, or else are practically cosmopolitan.

The somewhat predominant East Indian influence upon the fauna of the West Central Pacific may well be influenced by the counter-equatorial current which flows eastward toward this region from the Philippines (see de Laubenfels, 1950, page 256, and following). On each side of it, the north and south equatorial currents flow toward the west. I had hoped to find more conspicuous distributional patterns of sponge species and, therefore, investigated currents carefully, but the evidence points to very thorough dispersal. This dispersal may be so uncertain that it happens only at geologically rare intervals and requires phenomenally favorable conditions. Thus, in the long intervals of nondispersal, mutations may yield species which have only local distribution. Probably local extinctions are also common, as a result of storms or topographical changes. It may be that each species, other than those generated by recent mutations, has at one time or another inhabited each and every part of the whole area, but that some species have perished in one place whereas other species have perished in another place.

Ecologically, it is interesting to note how often (wherever one is in the world) a certain environmental niche has its sponge of a certain appearance, provided only that the ecology be the same.

I have made extensive studies in the West Indies. There, in a certain sort of setting, one finds species of *Spongia.* So one often does in Micronesia. The same is true for *Haliclonas* and *Callyspongias,* although the species are different.

In exposed shallow water of the West Indies, one commonly finds a fleshy, ramose yellow sponge. One does likewise in the Western Tropical Pacific, and the sponge looks in life exactly like the matching West Indies sponge. It has the same color, the same texture to the fingers, and an indistinguishable consistency. The flesh appears to be identical. Upon dying, each has the same striking tendency to turn green, then purple, then black. Yet, under microscope, the fibers of the West Indian one prove to be the pith-filled ones typical of *Verongia,* while those of the Pacific one are the debris-filled fibers of *Thorectopsamma.* How closely are these two sponges (now put in two genera) really related?

In these same locations in the West Indies, one commonly finds a brown, irregular, or ramose, sponge with small conules and finely wrinkled skin. In the Western Tropical Pacific one finds a sponge that looks in life exactly like the corresponding West Indies sponge. It has the same color, and the same texture to the fingertips; its consistency is indistinguishable, and its flesh appears to be identical. Yet, under the microscope, the skeleton of the West Indian one proves to be characterized by the fascicular main fibers, supplemented by loose filaments, typical of *Ircinia;* while those of the Pacific one are again the stratified, debris-filled fibers of *Thorectopsamma.* How closely are *Thorectopsamma* and *Ircinia* related?

The outstanding matter pertaining to Porifera is the obviously immense amount that mankind still does not know about these beautiful animals.

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PLATES

Plate I. *Spongia officinalis* subspecies *matamata* macerated skeleton, X 1.6.

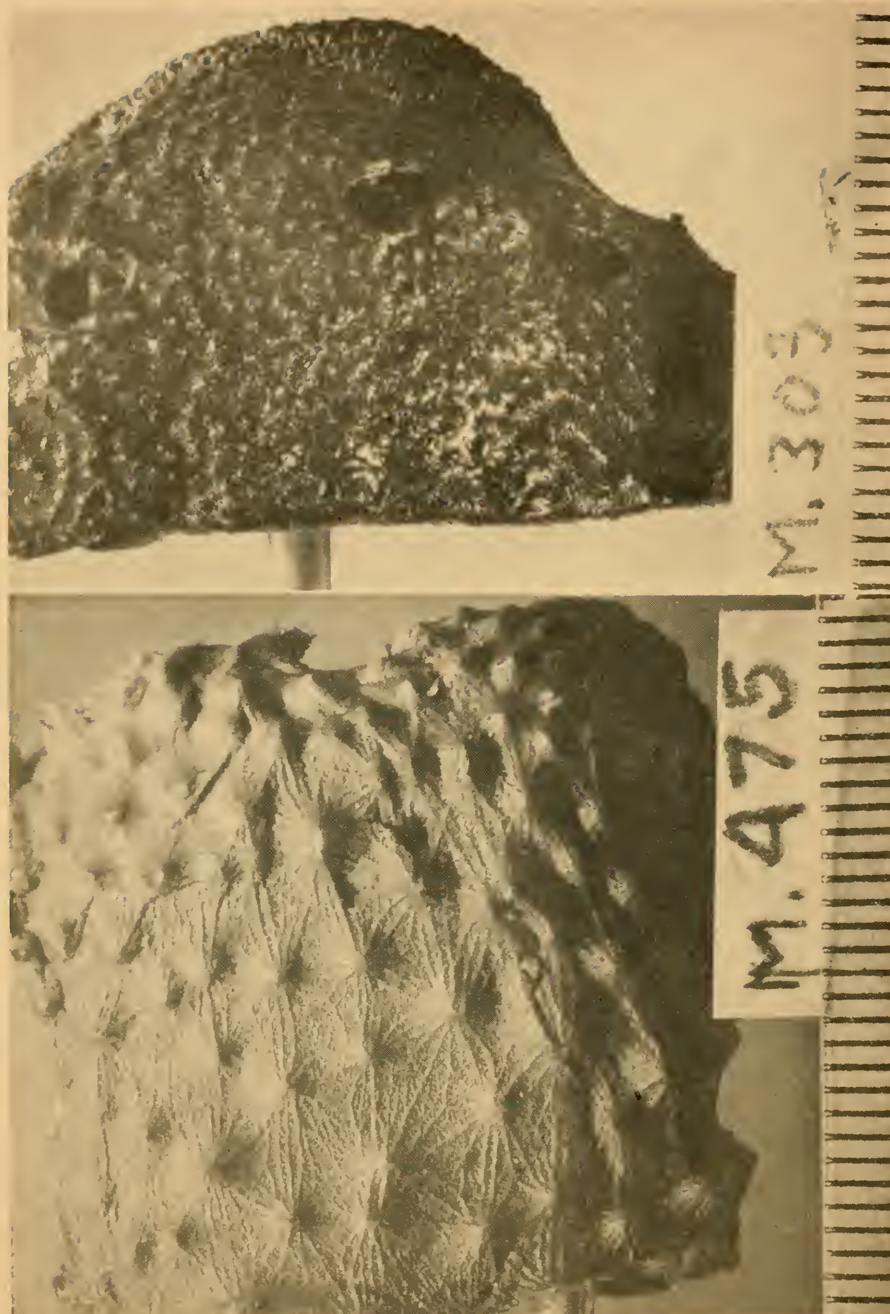

Plate II. Figure a. (above) *Spongia officinalis* subspecies *matamata,* X 3.2. Figure b. (below) *Hippiospongia communis,* X 3.2.

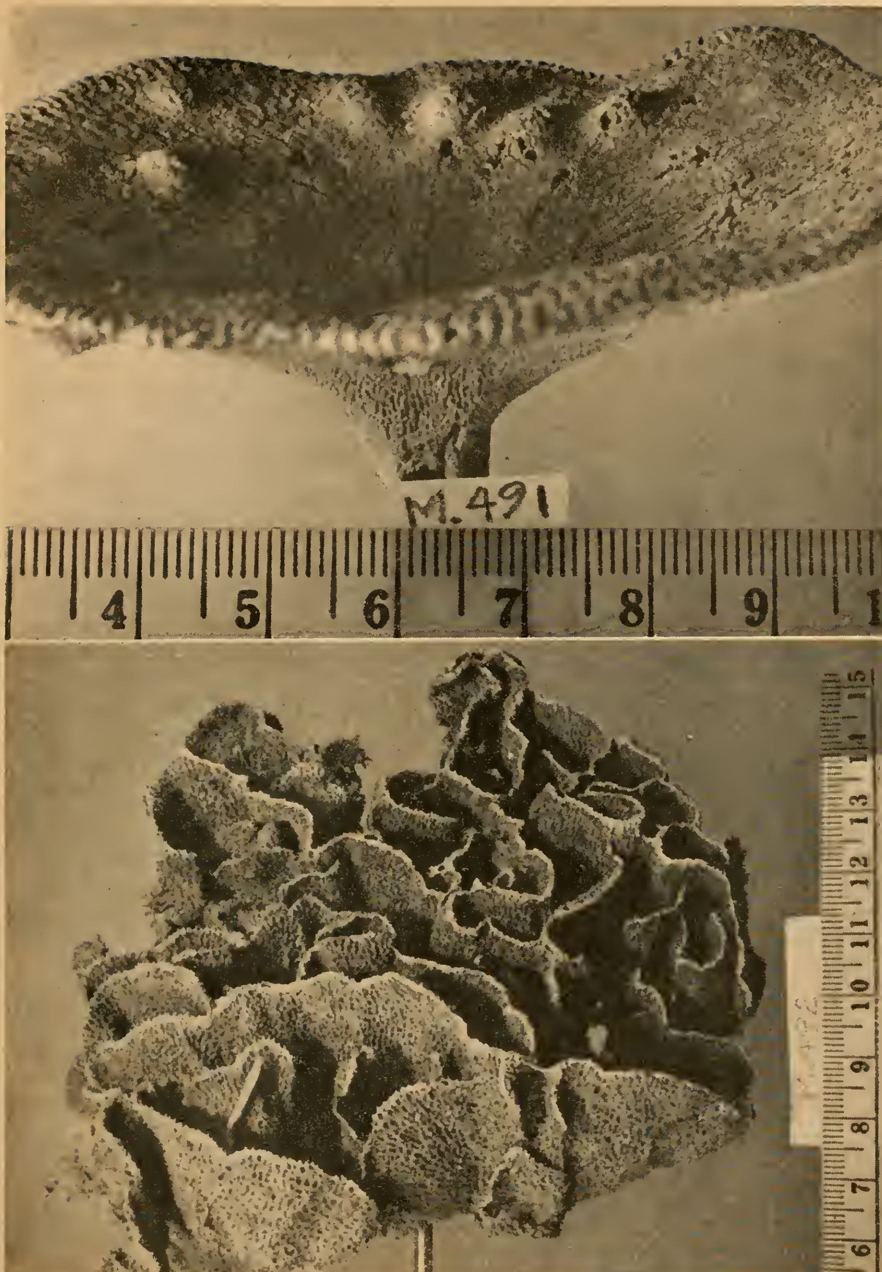

Plate III. Figure a. (above) *Phyllospongia complex,* X 0.8. Figure b. (below) *Phyllospongia lekanis,* X 1.7.

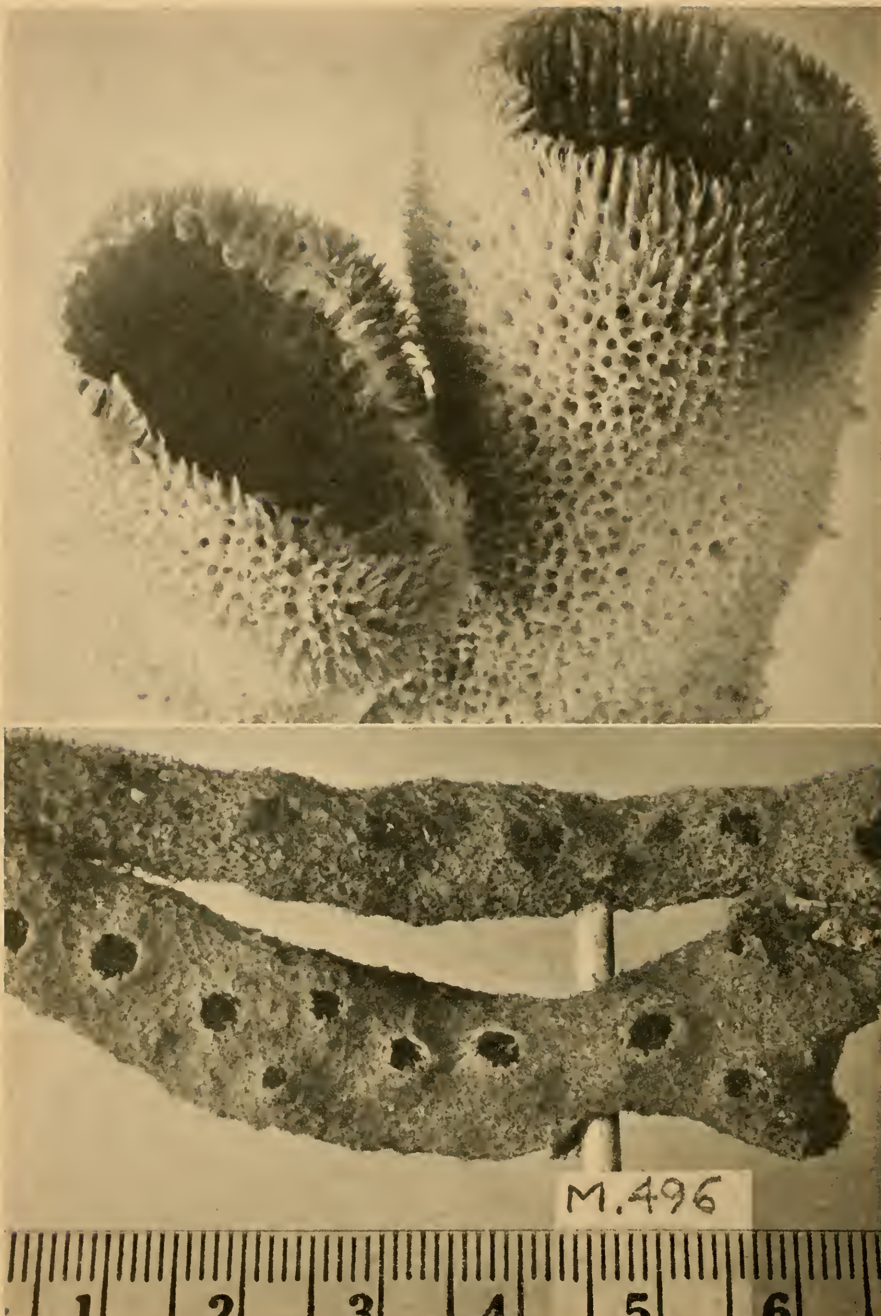

Plate IV. Figure a. (above) *Cribrochalina olemda,* X 1.4. Figure b. (below) *Callyspongia diffusa,* X 1.8.

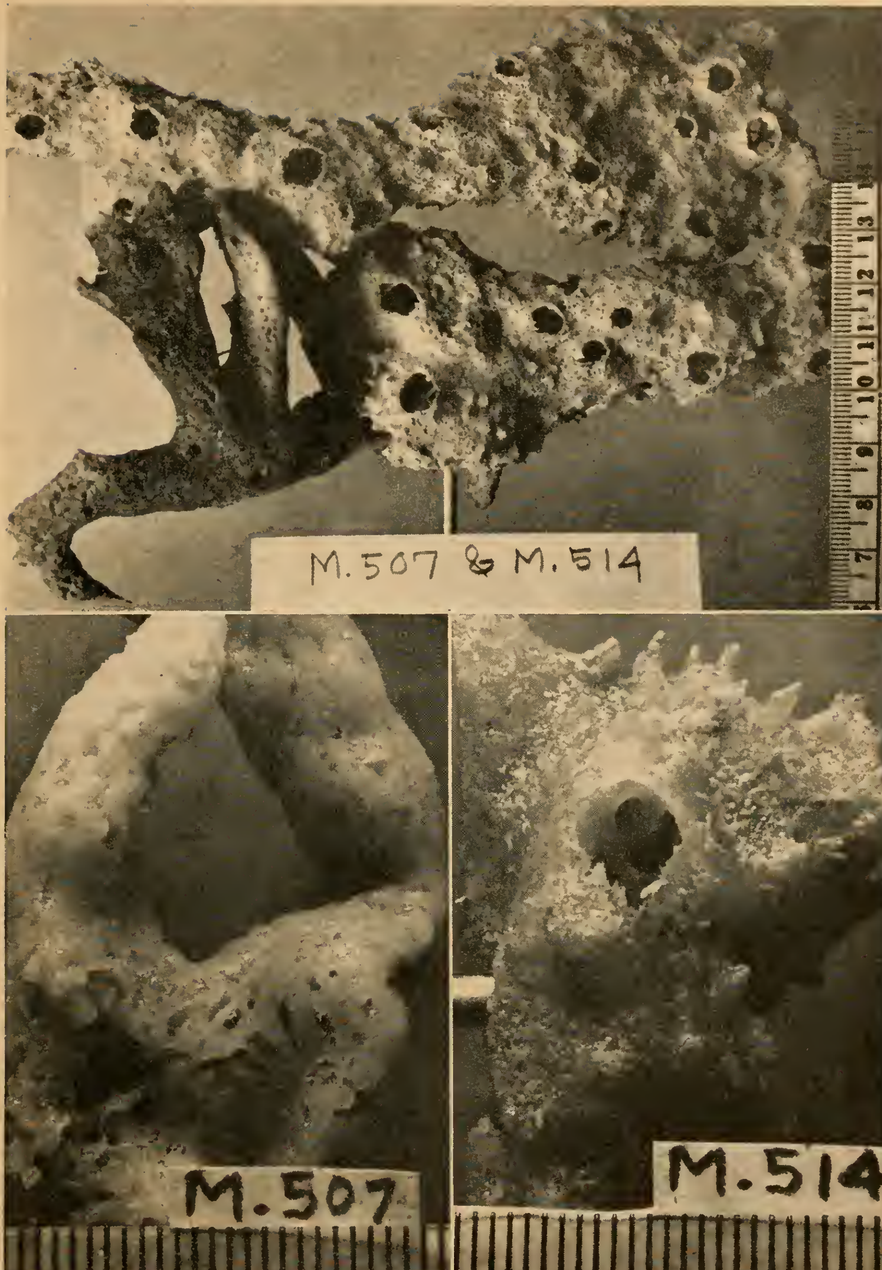

Plate V. Figure a. (above) *Gelliodes gracilis* (left) and *Gelliodes callista* (right). Dry specimens, X 0.7. Figure b. (below, left) *Gelliodes gracilis,* X 2.3. Figure c. (below, right) *Gelliodes callista,* X 2.3.

Plate VI. Figure a. (above) *Ichnodonax kapne*, X 1.6. Figure b. (below) *Biemna fortis*, X 1.6.

Plate VII. Figure a. (above) *Kieplitela antrodes,* X 1.7. Figure b. (below) *Dictyonella dasyphylla,* X 1.7.

Plate VIII. Figure a. (above) *Auletta bia,* X 2.7. Figure b. (below) *Lissodendoryx calypta* on *Thorectopsamma mela,* X 2.7.

Plate IX. Figure a. *Kallypilidion poseidon,* X 0.7. Figure b. *Anthosigmella vagabunda,* X 1.4.

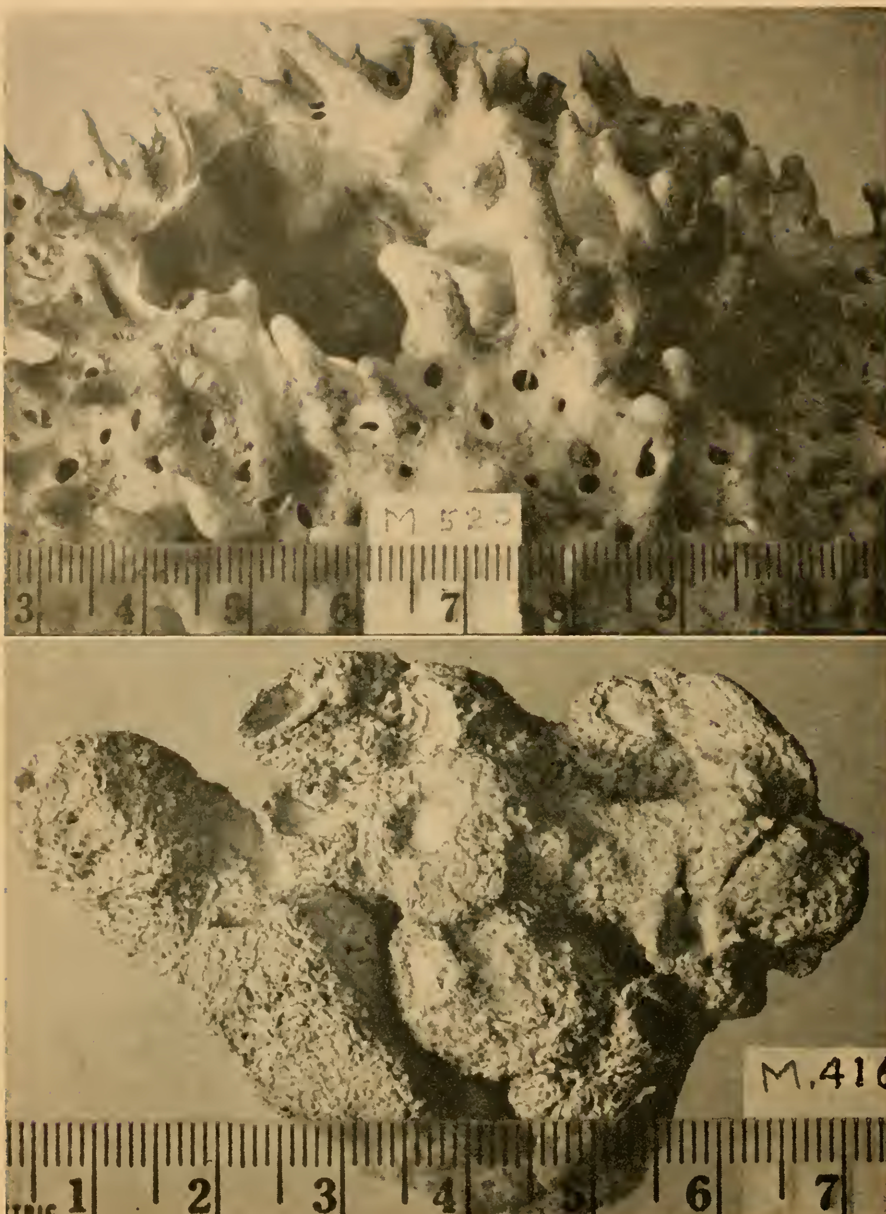

Plate X. Figure a. (above) *Stellettinopsis isis,* X 1.4. Figure b. (below) *Dorypleres splendens,* X 1.6.

Plate XI. Figure a. (above) *Haliclona streble,* X 2.6. Figure b. (below, left) *Cinachyra porosa,* X 2.6. Figure c. (below, right) *Tethya actinia,* X 3.6.

Plate XII. Figure a. (above) *Craniella abracadabra*, X 2.6. Figure b. (below) *Leucetta avocada*, X 1.6.

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